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# BULLETIN
OF THE
# INTERNATIONAL RAILWAY CONGRESS
ASSOCIATION
(ENGLISH EDITION)

[ 385. (06.111 ]

## NINTH SESSION

ROME : APRIL 1922

# SUMMARY OF PROCEEDINGS

## SUMMARY

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# LIST OF THE PAPERS PUBLISHED.

## *A.* — As the questions are inserted in the agenda for discussion.

| NUMBER of the question. | TITLE OF THE QUESTION. | DOCUMENTS. | YEAR AND PAGE of the English *Bulletin*. | NUMBER of the separate issue. |
|---|---|---|---|---|
| Special question. | Constitution. — Compilation of rules and regulations of the International Railway Association. | Report, by Mr. J. Verdeyen . . . . . | 1922, vol. IV, p. 305. | 57 |
| I | Construction of the road bed and of the track. | 1st Report (America), by Mr. H. U. Mudge. | 1914, vol. XXVIII, p. 713. | 2 |
| | | 2nd Report (all countries, except Denmark, Sweden, Norway, Great-Britain and America), by Messrs. Henry and Candelier. | 1920, vol. II, p. 639. | 8 |
| | | Supplement to 2nd Report, by Messrs. Henry and Candelier. | 1922, vol. IV, p. 251. | 56 |
| | | 3rd Report (America), by Mr. Charles H. Ewing. | 1921, vol. III, p. 835. | 20 |
| | | 4th Report (Denmark, Sweden and Norway), by Mr. K. Ahlberg. | 1921, vol. III, p. 1147. | 28 |
| | | 5th Report (Great-Britain), by Mr. E. F. C. Trench. | 1921, vol. III, p. 991. | 24 |
| II | Maintenance and supervision of the track. | 1st Report (America), by Mr. Epes Randolph. | 1920, vol. II, p. 665. | 9 |
| | | 2nd Report (Great-Britain), by Mr. Chas. J. Brown. | 1921, vol. III, p. 663. | 18 |
| | | 3rd Report (America), by Mr. Earl Stimson. | 1921, vol. III, p. 977. | 23 |
| | | 4th Report (other countries), by Mr. Joseph Barbieri. | 1922, vol. IV, p. 139. | 54 |
| III | Special steels . . . . . . | 1st Report (America), by Mr. W. C. Cushing. | 1921, vol. III, p. 577. | 16 |
| | | 2nd Report (all countries, except France and America), by Mr. Sand. | 1920, vol. II, p. 563. | 6 |
| | | Supplement to the 2nd Report, by Mr. Sand. | 1921, vol. III, p. 1103. | 26 |

| NUMBER of the question. | TITLE OF THE QUESTION. | DOCUMENTS. | YEAR AND PAGE of the English *Bulletin.* | NUMBER of the separate issue. |
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| **III** *(continued).* | Special steels *(continued)* | 3rd Report (France), by M. Mesnager. | 1921, vol. III, p. 2025. | 45 |
| **IV** | Reinforced concrete . . . . | 1st Report (all countries, except Denmark, Sweden, Norway, Holland, Great-Britain and America), by Mr. Marcel Castiau. | 1921, vol. III, p. 99. | 12 |
| | | 2nd Report (Holland), by Mr. C. Leemans. | 1921, vol. III, p. 3. | 11 |
| | | 1st Supplement to the 2nd Report, by C. Leemans. | 1921, vol. III, p. 1108. | 27 |
| | | 2nd Supplement to the 2nd Report, by Mr. C. Leemans. | 1922, vol. IV, p. 347. | 59 |
| | | 3rd Report (America), by Mr. C. H. Cartlidge. | 1920, vol. II, p. 815. | 10 |
| | | 4th Report (America), by Mr. G. A. Haggander. | 1921, vol. III, p. 743. | 19 |
| | | 5th Report (Great-Britain), by Mr. W. W. Grierson. | 1921, vol. III, p. 761. | 19 |
| | | 6th Report (all countries, except Denmark, Norway, Sweden, Holland, Great-Britain and America), by Mr. A. L. Golard. | 1921, vol. III, p. 1851. | 42 |
| | | 7th Report (Denmark, Norway and Sweden), by Mr. P. M. Bülow. | 1922, vol. IV, p. 25. | 51 |
| **V** | Economic production and use of steam on locomotives. | 1st Report (all countries, except those using the English language), by Mr. Maurice Lacoin. | 1921, vol. III, p. 1157. | 29 |
| | | 2nd Report (countries using the English language), by Mr. G. J. Churchward. | 1921, vol. III, p. 1527. | 36 |
| **VI** | Bogies (trucks), axles and springs of locomotives. | 1st Report (Belgium, Denmark, Norway and Sweden), by Mr. E. Minsart. | 1921, vol. III, p. 2039. | 46 |
| | | 2nd Report (all countries, except those using the English language, Belgium, Denmark, Sweden and Norway), by Mr. Bochet. | 1922, vol. IV, p. 193. | 55 |
| | | 3rd Report (countries using the English language), by Mr. George Hughes. | 1921, vol. III, p. 1589. | 38 |
| **VII** | Passenger carriages . . . . | 1st Report (America), by Mr. B. F. Bush. | 1914, vol. XXVIII, p. 839. | 3 |
| | | 2nd Report (Spain, Portugal and countries using the same language), by Mr. F. de Vargas. | 1921, vol. III, p. 461. | 15 |
| | | 3rd Report (America), by Mr. W. J. Tollerton. | 1921, vol. III, p. 1399. | 33 |

| NUMBER of the question. | TITLE OF THE QUESTION. | DOCUMENTS. | YEAR AND PAGE of the English *Bulletin*. | NUMBER of the separate issue. |
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| **VII** (*continued*). | Passenger carriages (*continued*). | 4th Report (all countries, except Spain, Portugal and countries using the same language, Great Britain and America), by Mr. E. Biard. | 1921, vol. III, p. 1205. | 30 |
| | | 5th Report (Great-Britain, India, Australasia and South Africa), by Mr. Robert W. Reid. | 1921, vol. III, p. 1859. | 43 |
| **VIII** | Electric traction. | 1st Report (Switzerland), by Mr. E. Huber. | 1921, vol. III, p. 1357. | 32 |
| | | 2nd Report (Sweden, Norway and Denmark), by Mr. I. Ofverholm. | 1921, vol. III, p. 1934. | 44 |
| | | 3rd Report (Italy), by Mr. Alfredo Donati. | 1921, vol. III, p. 2175. | 48 |
| | | 4th Report (Holland and Great Britain), by Mr. J. J. W. van Loenen Martinet. | 1921, vol. III, p. 1441. | 32 |
| | | 5th Report (America), by Mr. George Gibbs. | 1921, vol. III, p. 2091. | 47 |
| | | 6th Report (all countries, except Holland, Great Britain, Belgium, Denmark, Norway, Sweden, Italy, Switzerland and America), by Mr. Sabouret. | 1922, vol. IV, p. 107. | 52 |
| | | 7th Report (Belgium), by Mr. Ernest Gerard. | 1922, vol. IV, p. 763. | 64 |
| **IX** | Terminal stations for passengers. | 1st Report (countries using the English language), by Mr. A. S. Baldwin. | 1921, vol. III, p. 1483. | 35 |
| | | Supplement to the 1st Report, by Mr. A. S. Baldwin. | 1921, vol. III, p. 1927. | 35 |
| | | 2nd Report (other countries), by Mr. L. Maccallini. | 1922, vol. IV, p. 553. | 62 |
| **X** | Goods (freight) stations . . | 1st Report (all countries, except Italy and those using the English language), by Messrs. Julien and Moutier. | 1922, vol. IV, p. 151. | 50 |
| | | 2nd Report (Italy), by Mr. Edilio Ehrenfreund. | 1922, vol. IV, p. 5. | 50 |
| | | 3rd Report (countries using the English language), by Mr. H. G. Kelley. | 1922, vol. IV, p. 785. | 66 |
| **XI** | Slow-freight traffic . . . . | 1st Report (all countries, except America, Belgium, France and Great Britain), by Mr. Edilio Ehrenfreund. | 1921, vol. III, p. 377. | 14 |
| | | 2nd Report (Great Britain), by Sir H. A. Walker. | 1920, vol. II, p. 731. | 4 |
| | | 3rd Report (France), by Mr. Guerber. . | 1921, vol. III, p. 641. | 17 |
| | | 4th Report (Belgium), by Mr. U. Lamalle. | 1921, vol. III, p. 857. | 21 |

| NUMBER of the question. | TITLE OF THE QUESTION. | DOCUMENTS. | YEAR AND PAGE of the English *Bulletin*. | NUMBER of the separate issue. |
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| **XI** (*Continued.*) | Slow-freight traffic (*continued*). | 5th Report (America), by Mr. W. H. Williams. | 1921, vol. III, p. 1087. | 25 |
| **XII** | Locomotive cab signals . . | 1st Report (France), by Mr. Ferdinand Maison. | 1921, vol. III, p. 1709. | 39 |
| — | — | 2nd Report (France), by Mr. J. Verdeyen. | 1922, vol. IV, p. 537. | 63 |
| | | 3rd Report (other countries), by Mr. F. Villa. | 1922, vol. IV, p. 821. | 65 |
| **XIII** | Net cost. Rates . . . . . | 1st Report (America), by Mr. Fairfax Harrison. | 1914, vol. XXVIII, p. 857. | 5 |
| | | 2nd Report (all countries, except America), by Mr. Henry-Gréard. | 1922, vol. IV, p. 331. | 58 |
| | | 3rd Report (America), by Mr. Samuel O. Dunn. | 1922, vol. IV, p. 123. | 53 |
| **XIV** | Customs examination . . . | Report, by Messrs. Jourdain and Prudent. | 1921, vol. III, p. 1801. | 40 |
| **XV** | Interchange of rolling stock. | 1st Report (America), by Mr. C. W. Crawford. | 1921, vol. III, p. 1275. | 31 |
| | | 2nd Report (other countries), by Mr. Charron. | 1922, vol. IV, p. 479. | 61 |
| **XVI** | Workmen's dwellings . . . | 1st Report (America), by Mr. A.F. Banks. | 1914, vol. XXVIII, p. 595. | 1 |
| | | 2nd Report (other countries), by Mr. F. Lolli. | 1922, vol. IV, p. 359. | 60 |
| **XVII** | Carriages and wagons for light railways. | Report, by Mr. Carlo Gaviraghi. . . . | 1921, vol. III, p. 2075. | 49 |
| **XVIII** | Operation of light railways. Working rules and regulations. | Report, by Mr. F. Level. . . . . . . | 1921, vol. III, p. 1471. | 34 |
| **XIX** | Special methods of traction on light railways. | 1st Report (America), by Mr. H. B. Spencer. | 1920, vol. II, p. 571. | 7 |
| | | 2nd Report (other countries), by Mr. Pietro Biraghi. | 1921, vol. III, p. 1811. | 41 |
| **XX** | Safety appliances on light railways. | 1st Report, by Mr. Serge de Kareischa. | 1921, vol. III, p. 247. | 13 |
| | | 2nd Report, by Mr. A. Bonnevie . . . | 1921, vol. III, p. 1539. | 37 |
| Motion | Utility of studying the question of the use of liquid fuel in locomotives. | Note, by Sir Henry Fowler. . . . . | 1921, vol. III, p. 923. | 22 |

## *B.* — As issued.

| NUMBER of the separate issue. | NUMBER of the question. | TITLE OF THE QUESTION. | DOCUMENTS. |
|---|---|---|---|
| 1 | XVI | Workmen's dwellings . . . . . . | 1st Report (America), by Mr. A. F. Banks. |
| 2 | I | Construction of the road bed and of the track. | 1st Report (America), by Mr. H. U. Mudge. |
| 3 | VII | Passenger carriages . . . . . . . | 1st Report (America), by Mr. B. F. Bush. |
| 4 | XI | Slow-freight traffic . . . . . . . | 2nd Report (Great Britain), by Sir H. A. Walker. |
| 5 | XIII | Net cost. Rates . . . . . . . . | 1st Report (America), par Mr. Fairfax Harrison. |
| 6 | III | Special steels . . . . . . . . . | 2nd Report (all countries, except France and America), by Mr. Sand. |
| 7 | XIX | Special methods of traction on light railways. | 1st Report (America), by Mr. H. B. Spencer. |
| 8<br>(see also No. 2) | I | Construction of the road bed and of the track. | 2nd Report (all countries, except Denmark, Sweden, Norway, Great Britain and America), by Messrs. Henry and Candelier. |
| 9 | II | Maintenance and supervision of the track. | 1st Report (America), by Mr. Epes Randolph. |
| 10 | IV | Reinforced concrete . . . . . . . | 3rd Report (America), by Mr. C. H. Cartlidge. |
| 11<br>(see also No. 10) | IV | Reinforced concrete . . . . . . . | 2nd Report (Holland), by Mr. C. Leemans. |
| 12<br>(see also Nos. 10 and 11) | IV | Reinforced concrete . . . . . . | 1st Report (all countries, except Denmark, Sweden, Norway, Holland, Great Britain and America), by Mr. Marcel Castiau. |
| 13 | XX | Safety appliances on light railways. | 1st Report, by Mr. Serge de Kareischa. |
| 14<br>(see also No. 4) | XI | Slow-freight traffic . . . . . . . | 1st Report (all countries, except America, Belgium, France and Great Britain), by Mr. Edilio Ehrenfreund. |
| 15<br>(see also No. 3) | VII | Passenger carriages . . . . . . . | 2nd Report (Spain, Portugal and countries using the same language), by Mr. F. de Vargas. |
| 16<br>(see also No. 6) | III | Special steels . . . . . . . . | 1st Report (America), by Mr. W. C. Cushing. |
| 17<br>(see also Nos. 4 and 14) | XI | Slow-freight traffic . . . . . . . | 3rd Report (France), by Mr. Guerber. |
| 18<br>(see also No. 9) | II | Maintenance and supervision of the track. | 2nd Report (Great Britain), by Mr. Chas. J. Brown. |

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| 19 (see also Nos. 10, 11 and 12) | IV | Reinforced concrete . . . . . . . | 4th Report (America), by Mr. G. A. Haggander.<br>5th Report (Great Britain), by Mr. W. W. Grierson. |
| 20 (see also Nos. 2 and 8) | I | Construction of the road bed and of the track. | 3rd Report (America), by Mr. Charles H. Ewing. |
| 21 (see also Nos. 4, 14 and 17) | XI | Slow-freight traffic . . . . . . . . | 4th Report (Belgium), by Mr. U. Lamalle. |
| 22 | Motion | Utility of studying the question of the use of liquid fuel in locomotives. | Note, by Sir Henry Fowler. |
| 23 (see also Nos. 9 and 18) | II | Maintenance and supervision of the track. | 3rd Report (America), by Mr. Earl Stimson. |
| 24 (see also Nos. 2, 8 and 20) | I | Construction of the road bed and of the track. | 5th Report (Great Britain), by Mr. E. F. C. Trench. |
| 25 (see also Nos. 4, 14, 17 and 21) | XI | Slow-freight traffic . . . . . . . | 5th Report (America), by Mr. W. H. Williams. |
| 26 (see also Nos. 6 and 16) | III | Special steels . . . . . . . . . | Supplement to 2nd Report (all countries, except France and America), by Mr. Sand. |
| 27 (see also Nos. 10, 11, 12 and 19) | IV | Reinforced concrete . . . . . . . | 1st Supplement to 2nd Report (Holland), by Mr. C. Leemans. |
| 28 (see also Nos. 2, 8, 20 and 24) | I | Construction of the road bed and of the track. | 4th Report (Denmark, Sweden and Norway), by Mr. K. Ahlberg. |
| 29 | V | Economic production and use of steam on locomotives. | 1st Report (all countries, except those using the English language), by Mr. Maurice Lacoin. |
| 30 (see also Nos. 3 and 15) | VII | Passenger carriages . . . . . . . | 4th Report (all countries, except Spain, Portugal and countries using the same language, Great Britain and America), by Mr. E. Biard. |
| 31 | XV | Interchange of rolling stock . . . | 1st Report (America), by Mr. C. W. Crawford. |
| 32 | VIII | Electric traction . . . . . . . . | 1st Report (Switzerland), by Mr. E. Huber.<br>4th Report (Holland and Great Britain), by Mr. J. J. W. van Loenen Martinet. |
| 33 (see also Nos. 3, 15 and 30) | VII | Passenger carriages . . . . . . . | 3rd Report (America), by Mr. W. J. Tollerton. |
| 34 | XVIII | Operation of light railways. Working rules and regulations. | Report, by Mr. F. Level. |

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| 35 | IX | Terminal stations for passengers. . | 1st Report (countries using the English language), by Mr. A. S. Baldwin.<br>Supplement to the 1st Report, by Mr. A. S. Baldwin. |
| 36 (see also No. 29) | V | Economic production and use of steam on locomotives. | 2nd Report (countries using the English language), by Mr. G. J. Churchward. |
| 37 (see also No. 13) | XX | Safety appliances on light railways. | 2nd Report, by Mr. A. Bonnevie. |
| 38 | VI | Bogies (trucks), axles and springs of locomotives. | 3rd Report (countries using the English language), by Mr. George Hughes. |
| 39 | XII | Locomotive cab signals . . . . . | 1st Report (France), by Mr. Ferdinand Maison. |
| 40 | XIV | Customs examination. . . . . . . | Report, by Messrs. Jourdain and Prudent. |
| 41 (see also No. 7) | XIX | Special methods of traction on light railways. | 2nd Report (all countries, except America), by Mr. Pietro Biraghi. |
| 42 (see also Nos. 10, 11, 12, 19 and 27) | IV | Reinforced concrete . . . . . . . | 6th Report (all countries, except Denmark, Norway, Sweden, Holland, Great Britain and America), by Mr. A. L. Golard. |
| 43 (see also Nos. 3, 15, 30 and 33) | VII | Passenger carriages . . . . . . . | 5th Report (Great Britain, India, Australasia and South Africa), by Mr. Robert W. Reid. |
| 44 (see also No. 32) | VIII | Electric traction . . . . . . . . | 2nd Report (Sweden, Norway and Denmark), by Mr. I. Ofverholm. |
| 45 (see also Nos. 6, 16 and 26) | III | Special steels . . . . . . . . . | 3rd Report (France), by Mr. Mesnager. |
| 46 (see also No. 38) | VI | Bogies (trucks), axles and springs of locomotives. | 1st Report (Belgium, Denmark, Norway and Sweden), by Mr. E. Minsart. |
| 47 (see also Nos. 32 and 44) | VIII | Electric traction . . . . . . . . | 5th Report (America), by Mr. George Gibbs. |
| 48 (see also Nos. 32, 44 and 47) | VIII | Electric traction . . . . . . . . | 3rd Report (Italy), by Mr. Alfredo Donati. |
| 49 | XVII | Carriages and wagons for light railways. | Report, by Mr. Carlo Gaviraghi. |
| 50 | X | Goods (freight) stations . . . . . | 2nd Report (Italy), by Mr. Edilio Ehrenfreund.<br>1st Report (all countries, except Italy and those using the English language), by Messrs. Jullien and Moutier. |

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|---|---|---|---|
| 51<br>(see also Nos. 10, 11, 12, 19, 27 and 42) | VI | Reinforced concrete . . . . . . . | 7th Report (Denmark, Norway and Sweden), by Mr. P. M. Bülow. |
| 52<br>(see also Nos. 32, 44, 47 and 48) | VIII | Electric traction . . . . . . . | 6th Report (all countries, except Holland, Great Britain, Belgium, Denmark, Norway, Sweden, Italy, Switzerland and America), by Mr. Sabouret. |
| 53<br>(see also No. 5) | XIII | Net cost. Rates . . . . . . . . . | 3rd Report (America), by Mr. Samuel O. Dunn. |
| 54<br>(see also Nos. 9, 18 and 23) | II | Maintenance and supervision of the track. | 4th Report (all countries, except Great Britain and America), by Mr. Joseph Barbieri. |
| 55<br>(see also Nos. 38 and 46) | VI | Bogies (trucks), axles and springs of locomotives. | 2nd Report (all countries, except those using the English language, Belgium, Denmark, Sweden and Norway), by Mr. Bochet. |
| 56<br>(see also Nos. 2, 8, 20, 24 and 28) | I | Construction of the road bed and of the track. | Supplement to 2nd Report (all countries, except Denmark, Sweden, Norway, Great Britain and America), by Messrs. Henry and Candelier. |
| 57 | Special question. | Constitution. — Compilation of rules and regulations of the International Railway Association. | Report, by Mr. J. Verdeyen. |
| 58<br>(see also Nos 5 and 53) | XIII | Net cost. Rates . . . . . . . . . | 2nd Report (all countries, except America), by Mr. Henry-Gréard. |
| 59<br>(see also Nos. 10, 11, 12, 19, 27, 42 and 51) | IV | Reinforced concrete . . . . . . . | 2nd Supplement to 2nd Report (Holland), by Mr. C. Leemans. |
| 60<br>(see also No. 1) | XVI | Workmen's dwellings . . . . . . | 2nd Report (all countries, except America), by Mr. F. Lolli. |
| 61<br>(see also No. 31) | XV | Interchange of rolling stock. . . . | 2nd Report (all countries, except America), by Mr. Charron. |
| 62<br>(see also No. 35) | IX | Terminal stations for passengers. | 2nd Report (all countries, except those using the English language), by Mr. L. Maccallini. |
| 63<br>(see also No. 39) | XII | Locomotive cab signals. . . . . . | 2nd Report (France), by Mr. J. Verdeyen. |
| 64<br>(see also Nos. 32, 44, 47, 48 and 52) | VIII | Electric traction . . . . . . . . | 7th Report (Belgium), by Mr. Ernest Gerard. |
| 65<br>(see also Nos. 39 and 63) | XII | Locomotive cab signals. . . . . . | 3rd Report (all countries, except France), by Mr. F. Villa. |
| 66<br>(see also No. 50) | X | Goods (freight) stations . . . . | 3rd Report (countries using the English language), by Mr. H. G. Kelley. |

# PROGRAMME OF EVENTS

### Tuesday 18 April.

*At 11 a. m.* — Meeting of the permanent Commission. Reception of the delegates.

*At 3 p. m.* — Formal opening of the session honoured by the presence of His Majesty The King of Italy. After the opening, tribute to the grave of the unknown soldier.

### Wednesday 19 April.

*At 9 a. m. and 3 p. m.* — Meetings of the sections.

*At 8 p. m.* — Banquet offered by the Italian Government in the « Terme Diocleziane » at Rome.

### Thursday 20 April.

*At 9 a. m. and 3 p. m.* — Meetings of the sections.

*At 5.30 p. m.* — Reception at the Capitole.

### Friday 21 April.

*At 9 a. m.* — Meetings of the sections.

*At 3 p. m.* — Meeting of the special section intrusted with the examination of the statutes.

*At 2 and 4 p. m.* — Archeological visit.

### Saturday 22 April.

Excursion to Terni. (Visit of the steel works, hydroelectric and other works.)

*At 12 a. m* — Banquet offered by the manufacturers.

In the afternoon, visit of the water-fall « delle Marmore ».

### Sunday 23 April.

*At 9 p. m.* — Lecture by Engineer M. Margotta.

### Monday 24 April.

*At 9 a. m.* — Meetings of the sections.

*At 2 p. m.* — Visit of the Test Institute of Italian State Railways.

*At 3.30 p. m.* — Reception at the Palatin and archeological visit.

### Tuesday 25 April.

*At 9 a. m. and 3 p. m.* — Meetings of the sections.

*At 2 p. m.* — Visit of the Test Institute of Italian State Railways.

### Wednesday 26 April.

*At 8.30 a. m.* — Visit of the Test Institute of Italian State Railways.

*At 9 a. m.* — Meetings of the sections.

*At 3 p. m.* — General meeting.

### Thursday 27 April.

*At 9 a. m.* — Meetings of the sections.

*At 3 p. m.* — General meeting.

### Friday 28 April.

*At 10 a. m.* — General meeting and Formal closing of the session.

*At 4 p. m.* — Departure for Naples.

### Saturday 29 April.

Excursion to Pompei.

*At 8 p. m.* — Banquet offered by the manufacturers and traders at Naples.

### Sunday 30 April.

*First group.* — Excursion to Mount Vesuvius.

*Second group.* — Excursion to Capri. Excursion in the gulf of Naples.

*At 8.30 p. m.* — Special performance at the theatre San Carlo.

### Monday 1 May

Visit to the works of the new line Naples-Rome under construction.

*At 10 p. m.* — Reception at the Royal Palace.

*At 12 p. m.* — Departure for Genoa.

### Wednesday 3 May.

*First group.* — *At 9 a. m.* : Visit of Genoa harbour.

*Second group.* — *At 9 a. m.* : Excursion in the gulf of Genoa.

*At 12. 30 a. m.* — Banquet offered by the manufacturers at « Lido d'Albaro ».

*At 6 p. m.* — Reception by the authorities at the Palazzo Tursi.

# GENERAL LIST OF DELEGATES

*N. B.* — An asterisk (*) means that a delegate is already a member of the Congress in some other capacity, this latter being inserted in rackets. Members so marked are not included in the number allowed to their company.

◆ = Present at Rome.

## — Delegates of the permanent Commission.

### *A.* — PERMANENT COMMISSION.

*President :*

◆ V. **Tondelier**, administrateur-président honoraire, iembre du conseil d'administration des chemins de fer e l'Etat belge.

*Vice-presidents :*

◆ C. **Colson**, membre de l'Institut, inspecteur général es ponts et chaussées, conseiller d'Etat, ancien direc-eur des chemins de fer au ministère des travaux publics e France;

◆ E. **Gerard**, secrétaire général honoraire du ministère es chemins de fer, marine, postes et télégraphes de elgique, administrateur de la Société nationale belge es chemins de fer vicinaux.

*Members of the Executive Committee :*

◆ G. **Behrens**, director, Midland Railway;

◆ The Right Hon. Sir Evelyn **Cecil**, G. B. E., M. P., privy ouncillor, director, London & South Western Railway;

G. **Griolet**, vice-président du conseil d'administration e la Compagnie du chemin de fer du Nord français.

*Ex-president of session, member ex-officio :*

S. **Fish**, director, Missouri, Kansas & Texas Railway.

*Members of the permanent Commission :*

R. H. **Aishton**, president, American Railway Associa-ion;

◆ T. Andersen **Alstrup**, directeur général des chemins e fer de l'Etat danois;

◆ W. W. **Atterbury**, vice-president, Pennsylvania Rail-oad;

◆ F. **Bruneel**, administrateur-président des chemins de er de l'Etat belge;

C. de **Burlet**, inspecteur général des ponts et chaus-ées, directeur général honoraire de la Société nationale elge des chemins de fer vicinaux;

Lord **Churchill**, G. C. V. O., chairman, Great Western ailway;

◆ R. de **Cornè**, ingénieur, président du conseil supérieur es travaux publics d'Italie;

◆ C. **Corteil**, administrateur honoraire des chemins de er de l'Etat belge;

◆ C. **Crova**, ingénieur, directeur général des chemins de fer de l'Etat italien;

Sir Francis **Dent**, director, South Eastern & Chatham Railway;

◆ F. **De Rechter**, administrateur des chemins de fer de l'Etat belge;

◆ **Dinkelmann**, président de la direction générale des chemins de fer fédéraux suisses;

T. **Dutreux**, ingénieur civil, président du conseil d'administration du chemin de fer Guillaume-Luxembourg;

◆ **Fontaneilles**, président de la section des chemins de fer au conseil général des ponts et chaussées, directeur honoraire des chemins de fer au ministère des travaux publics de France;

Sir Guy **Granet**, director, Midland Railway and Central Argentine Railway;

A. **Granholm**, directeur général des chemins de fer de l'Etat suédois;

◆ Gaspare **Grillo**, chef de service principal à la direction générale des chemins de fer de l'Etat italien;

◆ C. **Hanrez**, administrateur des chemins de fer de l'Etat belge;

F. **Harrison**, president, Southern Railway;

◆ E. **Heurteau**, ingénieur en chef des mines, administrateur de la Compagnie des chemins de fer de Paris à Orléans;

J. H. **Hustis**, president, Boston & Maine Railroad;

H. G. **Kelley**, president, Grand Trunk Railway System;

L. F. **Loree**, president, Delaware & Hudson Railroad;

E. **Maristany**, marquis de l'Argentera, directeur général de la Compagnie des chemins de fer de Madrid à Saragosse et à Alicante;

◆ **Mauris**, directeur général honoraire et administrateur de la Compagnie des chemins de fer de Paris à Lyon et à la Méditerranée;

**Perouse**, inspecteur général des ponts et chaussées en retraite, directeur honoraire des chemins de fer au ministère des travaux publics de France, vice-président du conseil d'administration de la Compagnie des chemins de fer de Paris à Lyon et à la Méditerranée;

◆ G. **Philippe**, inspecteur général des lignes Nord belges;

E. **Rousseau**, conseiller d'Etat honoraire, directeur honoraire des chemins de fer au ministère des travaux publics de France;

◆ F. **Tajani**, ingénieur, président de la Fédération des transports;

◆ A. **Watson**, general manager, London & North Western and Lancashire & Yorkshire Railway;

**Weiss**, ingénieur en chef des ponts et chaussées, directeur honoraire et administrateur de la Compagnie des chemins de fer de l'Est français;

R. **Winkler**, ingénieur, directeur technique du département fédéral suisse des postes et des chemins de fer.

*Administrative councillor :*

◆ A. **Braem**, inspecteur général des chemins de fer de l'Etat belge.

*Secretary :*

◆ J. **Verdeyen**, ingénieur en chef, inspecteur de direction aux chemins de fer de l'Etat belge.

*Assistant secretaries :*

◆ R. **Desprets**, ingénieur principal aux chemins de fer de l'Etat belge;

◆ E. **Minsart**, ingénieur principal aux chemins de fer de l'Etat belge.

*Secretary-treasurer :*

◆ Ed. **Holemans**, inspecteur de direction honoraire des chemins de fer de l'Etat belge.

*Assistant secretary-treasurer :*

◆ J. **Habran**, inspecteur de direction aux chemins de fer de l'Etat belge.

*Chief clerks :*

◆ E. **Nollet**;

◆ E. **Heremans**.

### *B.* — ITALIAN ORGANISING COMMITTEE OF THE CONGRESS.

*President :*

◆ C. **Crova***, ingénieur, directeur général des chemins de fer de l'Etat italien (membre de la Commission permanente).

*Vice-presidents :*

◆ R. **de Cornè***, ingénieur, président du conseil supérieur des travaux publics d'Italie (membre de la Commission permanente);

◆ F. **Tajani***, ingénieur, président de la Fédération des transports (membre de la Commission permanente).

*Members :*

◆ F. **Allemand**, avocat, inspecteur général de l'office spécial des chemins de fer au ministère des travaux publics d'Italie;

◆ C. **Marzollo**, directeur général au ministère des travaux publics d'Italie;

◆ N. **Nicoli**, ingénieur, inspecteur supérieur et conseiller d'administration des chemins de fer de l'Etat;

◆ A. **Alessandri**, ingénieur, inspecteur supérieur et conseiller d'administration des chemins de fer de l'Etat;

◆ R. **Gioppo**, ingénieur, chef du service des travaux des chemins de fer de l'Etat;

◆ V. **Tondelli**, avocat, chef du service du mouvement et du trafic des chemins de fer de l'Etat;

◆ A. **Sapuppo**, ingénieur, chef du service des approvisionnements des chemins de fer de l'Etat;

◆ Q. **Orso**, ingénieur, chef du service du matériel et la traction des chemins de fer de l'Etat;

◆ D. **Serani**, ingénieur, chef du service de la compta lité des chemins de fer de l'Etat;

◆ A. **Mengoni**, avocat, chef du service du contenti des chemins de fer de l'Etat;

◆ V. **Margotta**, ingénieur, chef du service de la constr tion des chemins de fer de l'Etat;

◆ A. **Donati**, ingénieur, chef du service spécial de l'é trification des chemins de fer de l'Etat;

◆ E. **Talenti**, ingénieur, chef du compartiment de Ro des chemins de fer de l'Etat;

◆ G. **Pietri**, ingénieur, inspecteur supérieur des chem de fer de l'Etat;

◆ L. **Casinelli**, ingénieur, inspecteur en chef de l'of spécial des chemins de fer;

◆ C. **Nagel**, ingénieur, inspecteur supérieur de l'of spécial des chemins de fer;

◆ G. **Ottone**, ingénieur, administrateur-délégué de la ciété nationale de chemins de fer et tramways;

◆ P. **Biraghi**, ingénieur, administrateur-délégué du c min de fer Corleone-S. Carlo;

◆ U. **Cattaneo**, ingénieur, chef de l'Institut des ex riences des chemins de fer de l'Etat.

*First secretary :*

◆ E. **Franza**, avocat, chef du service du personnel et affaires générales des chemins de fer de l'Etat.

*Second secretary :*

◆ N. **Giovene**, ingénieur, inspecteur principal au ser du personnel et des affaires générales des chemins fer de l'Etat.

### *C.* — REPORTERS OF THE QUESTIONS SUBMITTE TO THE CONGRESS.

◆ K. **Ahlberg**, premier ingénieur du bureau de const tion de la voie des chemins de fer de l'Etat suédois;

◆ A. S. **Baldwin**, vice-président, Illinois Central R road;

A. F. **Banks**, president, Elgin, Joliet & Eastern R way;

◆ G. **Barbieri**, ingénieur, chef de division au service travaux des chemins de fer de l'Etat italien;

◆ **Biard**, ingénieur en chef honoraire de la Compag des chemins de fer de l'Est français (service du maté et de la traction);

◆ P. **Biraghi***, ingénieur, administrateur-délégué chemin de fer Corleone-San Carlo (membre de la sect italienne de la Commission permanente);

◆ **Bochet**, inspecteur général des mines, secrétaire comité de l'exploitation technique des chemins de fer ministère des travaux publics de France;

◆ **Bonnevie**, inspecteur général technique honoraire d Société nationale belge des chemins de fer vicinaux;

◆ C. J. **Brown**, M. I. C. E., C. B. E., engineer in ch Great Northern Railway;

P. M. **Bülow**, ingénieur, chef de bureau à la direction
énérale des chemins de fer de l'Etat danois;

**Charron**, ingénieur en chef adjoint au chef de l'exploi-
ation de la Compagnie des chemins de fer du Midi
ançais;

G. J. **Churchward**, chief mechanical engineer locomo-
ve, carriage and wagon superintendent, Great Western
ailway;

**Crawford**, chairman General Committee section V,
ransportation, American Railway Association;

W. C. **Cushing**, engineer standards, Pennsylvania Sys-
em;

A. **Donati***, ingénieur, chef du service spécial de l'élec-
rification des chemins de fer de l'Etat italien (membre
e la section italienne de la Commission permanente);

S. O. **Dunn**, editor, *Railway Age*;

E. **Ehrenfreund**, ingénieur, chef du département de
urin des chemins de fer de l'Etat italien;

C. H. **Ewing**, vice-president, Philadelphia & Reading
ailway;

Sir Henry **Fowler**, chief mechanical engineer, Midland
ailway;

C. **Gaviraghi**, ingénieur, directeur des chemins de fer
e la Haute Valteline;

E. **Gerard***, secrétaire général honoraire du ministère
es chemins de fer, marine, postes et télégraphes de
elgique, administrateur de la Société nationale belge
es chemins de fer vicinaux (vice-président de la Com-
ission permanente);

G. **Gibbs**, chief engineer of electric traction, Long
sland Railroad;

A. **Golard**, ingénieur en chef, directeur d'administra-
ion aux chemins de fer de l'Etat belge;

W. W. **Grierson**, chief engineer, Great Western Rail-
ay;

G. A. **Haggander**, bridge engineer, Chicago, Burlington
Quincy Railroad;

**Henry**, ingénieur en chef de la voie et des travaux à
a Compagnie des chemins de fer de l'Est français;

**Henry-Gréard**, chef de l'exploitation de la Compagnie
u chemin de fer d'Orléans;

E. **Huber**, ingénieur en chef du service de l'électrifica-
ion des chemins de fer fédéraux suisses;

G. **Hughes**, chief mechanical engineer, Lancashire &
orkshire Railway;

**Jourdain**, ingénieur en chef adjoint à la direction géné-
ale de la Compagnie des chemins de fer de Paris-Lyon-
éditerranée;

**Jullien**, ingénieur en chef de la voie et des travaux de
a Compagnie du chemin de fer d'Orléans;

. G. **Kelley***, president, Grand Trunk Railway System
membre de la Commission permanente);

**Lacoin**, ingénieur en chef du matériel et de la traction
la Compagnie du chemin de fer d'Orléans;

V. U. **Lamalle**, ingénieur en chef, directeur d'adminis-
ration aux chemins de fer de l'Etat belge;

◆ C. **Leemans**, ingénieur au service des voies et travaux de la Compagnie du chemin de fer hollandais;

◆ F. **Level**, directeur de la Compagnie générale de voies ferrées d'intérêt local;

◆ F. **Lolli**, ingénieur, chef de division au service des travaux des chemins de fer de l'Etat italien;

◆ L. **Maccallini**, ingénieur, inspecteur principal à la direction générale des chemins de fer de l'Etat italien;

◆ **Mesnager**, membre de l'Institut, inspecteur général des ponts et chaussées, professeur et directeur du laboratoire d'essais de l'Ecole des ponts et chaussées de France;

◆ E. **Minsart***, ingénieur principal à la direction de la traction et du matériel des chemins de fer de l'Etat belge (secrétaire-adjoint de la Commission permanente);

◆ **Moutier**, ingénieur, sous-chef de l'exploitation, chargé des services techniques de la Compagnie du chemin de fer du Nord français;

◆ **Öfverholm**, directeur du service électrotechnique des chemins de fer de l'Etat suédois;

◆ **Paris**, ingénieur en chef adjoint de l'entretien de la Compagnie du chemin de fer du Nord français;

**Prudent**, inspecteur général de l'exploitation de la Compagnie des chemins de fer de Paris à Lyon et à la Méditerranée;

◆ R. W. **Reid**, carriage and wagon superintendent, Midland Railway;

◆ **Sabouret**, ingénieur en chef adjoint au directeur de la Compagnie du chemin de fer d'Orléans;

◆ **Schrafl**, directeur général des chemins de fer fédéraux suisses;

H. B. **Spencer**, director, division of purchases, United States Railroad Administration;

E. **Stimson**, chief engineer maintenance, Baltimore & Ohio Railroad;

◆ W. J. **Tollerton**, chairman, mechanical division, American Railway Association, and general mechanical superintendent, Chicago, Rock Island & Pacific Railway;

◆ E. F. C. **Trench**, engineer in chief, London & North Western Railway;

◆ J. J. W. **van Loenen Martinet**, ingénieur pour la construction des lignes électriques des chemins de fer néerlandais;

◆ F. de **Vargas**, ingénieur en chef du matériel et de la traction de la Compagnie du chemin de fer du Nord de l'Espagne;

◆ J. **Verdeyen***, ingénieur en chef, inspecteur de direction aux chemins de fer de l'Etat belge (secrétaire de la Commission permanente);

◆ F. **Villa**, ingénieur en chef au service des travaux des chemins de fer de l'Etat italien;

◆ Sir Herbert A. **Walker**, general manager, London & South Western Railway;

W. H. **Williams**, vice-president, Delaware & Hudson Company.

### *D.* — Sectional secretaries.

◆ **Chavegrin**, docteur en droit, rédacteur principal au service du contentieux de la Compagnie des chemins de fer de Paris à Lyon et à la Méditerranée;

◆ **Depoorter**, ingénieur principal au service des voies et travaux des chemins de fer de l'Etat belge;

◆ **Gabbia**, chef de section de la voie et des travaux à la Compagnie des chemins de fer du Nord de l'Espagne;

◆ C. **Grillo**, general agent for Italy of the South Eastern & Chatham Railway;

◆ G. **Mayer**, attached to the Great Eastern Railway;

◆ M. de **Paiva Couceiro**, ingénieur adjoint à l'ingénieur en chef du matériel et de la traction de la Compagnie des chemins de fer portugais;

◆ E. **Uytborck**, ingénieur honoraire à l'Office de l'électricité du ministère des chemins de fer de Belgique;

◆ **Vallecchi**, ingénieur à la Fédération des transports d'Italie;

◆ **Vezzani**, ingénieur à la Fédération des transports d'Italie;

◆ **Viallefond**, ingénieur en chef adjoint de la voie de la Compagnie des chemins de fer de Paris à Lyon et à la Méditerranée;

◆ **Zutter**, secrétaire adjoint du premier arrondissement des chemins de fer fédéraux suisses.

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## II. — Members appointed by governments, and by railway administrations affiliated to the Association.

### *A.* — Government delegates.

### Argentine (Republic).

*Ministère des travaux publics.*

### Belgium.

*Ministère des chemins de fer, marine, postes et télégraphes :*

◆ **Tondelier***, administrateur-président honoraire, membre du conseil d'administration des chemins de fer de l'Etat (président de la Commission permanente);

◆ **Bruneel***, administrateur-président des chemins de fer de l'Etat (membre de la Commission permanente);

◆ **Hanrez***, administrateur des chemins de fer de l'Etat (membre de la Commission permanente);

◆ **Corteil***, administrateur honoraire des chemins de fer de l'Etat (membre de la Commission permanente);

◆ **De Rechter***, administrateur des chemins de fer de l'Etat (membre de la Commission permanente);

◆ J. **Colens**, secrétaire général;

◆ de **Loneux**, directeur général de l'Office de l'électricité;

◆ **Braem**, inspecteur général des chemins de fer de l'Etat;

◆ **Lamalle***, ingénieur en chef, directeur d'administration aux chemins de fer de l'Etat (rapporteur);

◆ **Golard***, ingénieur en chef, directeur d'administrat aux chemins de fer de l'Etat (rapporteur);

◆ **Willem**, ingénieur en chef, directeur d'administrat aux chemins de fer de l'Etat;

◆ J. **Verdeyen***, ingénieur en chef, inspecteur de di tion aux chemins de fer de l'Etat (secrétaire de la Co mission permanente et rapporteur);

◆ **Minsart***, ingénieur principal aux chemins de fer l'Etat, secrétaire du Cabinet du Ministre des chem de fer (rapporteur);

### Bolivia.

*Ministère des travaux publics.*

### Brazil.

*Ministère de l'industrie, des communications et travaux publics :*

◆ J. L. **Baptista**, ingénieur, sous-directeur du chemin fer central;

### Chili.

*Ministère des chemins de fer :*

◆ del **Rio**, ingénieur.

### China.

*Ministère des communications :*

◆ **Tsang Ou**, directeur général adjoint du chemin de du Lunghai;

◆ L. F. **Crimail**, ancien conseiller supérieur à la Co mission supérieure de l'unification du matériel;

◆ **Ouang Hang**, ingénieur au chemin de fer de Pék Hankow;

◆ **Tang Fong Sian**, ingénieur;

◆ **Sandberg**, ingénieur réceptionnaire du matériel de c min de fer en Europe.

### Denmark.

*Ministère des travaux publics :*

◆ T. **Alstrup***, directeur général des chemins de fer l'Etat (membre de la Commission permanente);

◆ F. T. M. M. **Nordlien**, chef de département au min tère des travaux publics, directeur général des té graphes;

◆ P. A. H. **Colding**, chef de bureau au ministère des tr vaux publics.

### Dominican Republic.

*Ministère des travaux publics :*

◆ **Sechino**, consul général à Gênes.

### Egypt.

*Ministère des communications :*

◆ J. **Maudsley**, sous-directeur général des chemins fer de l'Etat;

◆ **Tadros Bey Dimitri**, sous-secrétaire financier au m nistère des communications.

## Ecuador Republic.

*Ministère des travaux publics :*

◆ **P. P. Guzman**, ingénieur civil.

## Spain.

*Ministère du fomento :*

◆ **V. Salinas**, inspecteur général des ponts et chaussées;

◆ **L. Morales y Lopez Higuera**, ingénieur en chef des ponts et chaussées, chef du canal de Castille et de la canalisation du Manzanares;

◆ **J. M. Fuster**, ingénieur en chef du corps des chemins, canaux et ports, chef des études et constructions des chemins de fer du Nord-Est de l'Espagne.

## United States of America.

*Department of State :*

**Ch. C. McChord**, president, Interstate Commerce Commission;

**W. M. Daniels**, Commissioner, Interstate Commerce Commission;

◆ **W. F. Schleiter**;

◆ General **W. W. Atterbury***, vice-president of the Pennsylvania Railroad (membre de la Commission permanente);

**E. A. Simmons**, president of the Simmons-Boardman Company;

◆ **D. F. Crawford**, vice-president of the Locomotive Stoker Company;

◆ **J. W. Lieb**, formerly president of the American Institute of Electrical Engineers and former vice-president of the American Society of Mechanical Engineers.

## France and Colonies.

### A. — FRANCE.

*Ministère des travaux publics :*

◆ **Colson***, membre de l'Institut, président de section du onseil d'Etat, inspecteur général des ponts et chaussées (vice-président de la Commission permanente);

◆ **Fontaneilles***, inspecteur général des ponts et chaussées, président de section au conseil général des ponts et chaussées (membre de la Commission permanente);

**E. Rousseau***, conseiller d'Etat honoraire (membre de la Commission permanente);

◆ **Bochet***, inspecteur général des mines (rapporteur);

◆ **Mesnager***, membre de l'Institut, inspecteur général les ponts et chaussées (rapporteur);

**Le Besnerais**, ingénieur en chef des ponts et chaussées, rapporteur au Comité consultatif technique et commercial des chemins de fer;

**Chardon**, conseiller d'Etat;

◆ **Du Castel**, conseiller d'Etat, directeur général des chemins de fer au ministère des travaux publics;

◆ **Barrand**, inspecteur général des ponts et chaussées, directeur du contrôle de la voie et des bâtiments;

◆ **Maison**, inspecteur général des mines, directeur du contrôle de l'exploitation technique;

◆ **Rivet**, ingénieur en chef des mines, directeur du contrôle et de la traction;

◆ **De Ponteves**, ingénieur en chef des mines, directeur du contrôle du travail des agents de chemins de fer;

◆ **Detœuf**, ingénieur en chef des ponts et chaussées, membre du Comité consultatif technique et commercial des chemins de fer;

**Cottin**, ingénieur des ponts et chaussées, attaché à la direction des chemins de fer au ministère des travaux publics.

### B. — COLONIES.

### Tunis.

*Direction générale des travaux publics :*

**Mourgnot**, directeur général des travaux publics;

◆ **Favière**, ingénieur des ponts et chaussées, directeur général adjoint.

## Great Britain, India and Colonies.

### A. — Great Britain.

*Ministry of transport :*

◆ **J. W. Pringle**, C. B., chief inspecting officer of railways;

Sir **William M. Acworth**, M. A.;

◆ **J. R. Brooke**, C. B., principal assistant secretary to the Ministry of transport.

### B. — India, Protectorates and Colonies.

*Under Secretary of State for India :*

◆ **G. Deuchars**, Government director of Indian Railway companies;

◆ Sir **Robert R. Gales** Kt., late chief engineer of the Indian State Railways;

◆ **H. B. Taylor**, C. B. E., late chief engineer, Indian State Railways.

*Department of railways and canals of Canada.*

*Agent general for New South Wales in London.*

*High Commissioner for the Dominion of New Zealand in London.*

*Colony of Nigeria :*

◆ **F. H. Greenhough**, deputy general manager Nigerian Railways;

◆ **C. A. Cuningham**, chief accountant, Nigerian Railways.

## Greece.

*Ministère des communications :*

◆ G. **Bouyoukas**, inspecteur des chemins de fer de l'Etat;

◆ D. **Skinas**, inspecteur des chemins de fer de l'Etat.

## Hayti.

*Ministère des travaux publics.*

## Italy.

*Ministère des travaux publics :*

R. **Bianchi**, ingénieur, sénateur;

◆ A. **Ciappi**, professeur, ingénieur, député au parlement;

◆ A. **Netti**, ingénieur, député au parlement;

◆ E. **Stefini**, ingénieur, député au parlement;

◆ E. **Lanzerotti**, ingénieur, député au parlement;

◆ G. **Semenza**, ingénieur, membre de la II$^e$ section du conseil supérieur des eaux, mines et travaux publics;

◆ U. **Maccaferri**, inspecteur en chef de l'électrification des chemins de fer de l'Etat;

◆ F. **Genovesi**, président de la Société des chemins de fer électriques;

◆ E. **Grismayer**, ingénieur, professeur du cours de chemins de fer à l'école royale d'application des ingénieurs;

◆ P. **Lanino**, ingénieur.

## Japan.

*Ministère des communications :*

◆ Dr. M. **Nawa**, engineer;

◆ J. **Kume**, engineer;

◆ I. **Inouye**, engineer;

◆ K. **Oshima**, senior secretary;

◆ K. **Tanaka**, engineer;

◆ J. **Takaku**, junior secretary.

## Luxemburg.

*Direction générale des travaux publics :*

◆ A. **Lefort**, premier commissaire du gouvernement pour les chemins de fer.

## Mexico.

*Secrétariat des communications et des travaux publics :*

◆ A. **Barocio**, ingénieur.

## Norway.

*Ministère des travaux publics :*

◆ C. T. **Holtfodt**, directeur général de l'Administration des chemins de fer de l'Etat.

## Paraguay.

*Ministère des relations extérieures :*

◆ V. **Coppin**, consul général à Naples.

## Holland.

*Ministère du waterstaat :*

◆ L. M. **Barnet Lyon**, ingénieur civil, membre du conse de surveillance des chemins de fer;

◆ H. **van der Minne**, ingénieur civil, membre du conse de surveillance des chemins de fer;

◆ B. M. **Gratama**, ingénieur civil, ingénieur en chef d l'Etat au service des chemins de fer.

## Peru.

*Ministère du fomento.*

## Poland.

*Ministère des chemins de fer :*

◆ M. **Loret**, conseiller de légation;

◆ J. **Gieysztor**, professeur, vice-directeur de département

◆ A. **Frank**, ingénieur;

◆ A. B. **Barber**, conseiller technique du gouvernement.

## Portugal.

*Ministère du commerce et des communications :*

◆ A. J. **Dantas**, ingénieur, directeur général des chemin de fer et vice-président de la junte consultative des ch mins de fer;

◆ J. M. de **Oliveira Simôes**, ingénieur, directeur génér du commerce et de l'industrie;

◆ J. de **Sousa**, ingénieur, assesseur de la junte consulta tive des chemins de fer;

◆ A. de **Queiroz e Vasconcellos**, ingénieur, chef de div sion du mouvement et du trafic de la direction fisca des chemins de fer;

J. P. **Correia de Brito**, ingénieur, chef de répartitio des chemins de fer et vogal (assesseur), secrétaire d la junte consultative des chemins de fer;

◆ C. A. P. **Machado**, ingénieur, chef de division du matéri et de la traction de la direction fiscale des chemin de fer.

## Rumania.

*Ministère des travaux publics.*

## Kingdom of Servians, Croatians and Slovenish

*Ministère des communications.*

## Siam.

*Ministère des voies de communication :*

◆ G. **Canova**, chef du service technique des chemins d fer de l'Etat;

◆ C. P. **Sandberg***, ingénieur-conseil aux chemins de f de l'Etat (délégué du gouvernement chinois).

## Sweden.

*Ministère de l'intérieur :*

◆ J. **Flodin**, directeur en chef des chemins de fer de 'Etat.

## Switzerland.

*Département fédéral des postes et des chemins de fer :*

Le Dr. **Herold**, directeur de la division des chemins de er;

◆ **Schrafl***, directeur général des chemins de fer fédéaux (rapporteur);

◆ F. **Stalder**, ingénieur, adjoint à l'inspecteur de la secion de mécanique du département fédéral des postes t des chemins de fer;

◆ C. **Andreae**, ingénieur, professeur à l'Ecole polytechique suisse à Zurich.

## Czecho-Slovakia.

*Ministère des chemins de fer :*

◆ K. **Juránek**, ingénieur, directeur du département V/4.

## Uruguay.

*Ministère des travaux publics.*

*B.* — MEMBERS APPOINTED BY RAILWAY ADMINISTRATIONS AFFILIATED TO THE ASSOCIATION.

## Argentine Republic.

### I. — Lines of the State.

*Etat argentin (Chemins de fer de l')* (6 151 k.) :

A. **Acevedo**, ingénieur principal;

A. **Garimaldi**, chef de la comptabilité générale;

H. B. **Shaw**, ingénieur, chef de la division conservation du département technique;

A. **Pasquini**, ingénieur, chef du service des ateliers et du matériel;

F. **Garofalo**, ingénieur, chef du service de la traction.

### II. — Private lines.

*Buenos Ayres Great Southern Railway* (6 278 k. [3 901 miles]) :

Sir Albert E. **Bowen**, Bart., chairman;

H. C. **Allen**, deputy chairman;

◆ W. **Parish**, C. B. E., director;

Hon. W. **Baring**, director;

◆ J. P. **Clarke**, C. B. E., M. Inst. C. E., director;

◆ R. T. **Harper**, O. B. E., F. C. A., secretary;

Sir Harry **Livesey**, G. B. E., consulting engineer to the Company.

*Buenos Ayres Western Railway* (3 028 k. [1 882 miles])

Sir Henry **Bell**, baronet, chairman;

Sir Brodie **Henderson**, K. C. M. G., consulting engineer;

R. **Graham**, secretary.

*Central Argentine Railway* (5 319 k. ([3 305 miles]).

*Entre Rios Railways* (1 175 k. [730 miles]) :

F. **Holt**, chairman;

B. H. **Binder**, director;

A. **Cook**, director;

◆ J. **Williamson**, director;

◆ W. J. **George**, secretary.

*Rosario à Puerto Belgrano (Compagnie du chemin de fer de)* (800 k.) :

◆ R. **Beaugey**, inspecteur général des mines, directeur honoraire des chemins de fer de l'Etat français, président du conseil d'administration;

◆ J. **Comble**, administrateur;

G. **Verstraete**, administrateur;

Recope de **Tilly**, ingénieur civil des mines, secrétaire du conseil d'administration.

*Province de Santa-Fé (Compagnie française des chemins de fer de la)* (1 911 k.) :

Le comte **Lavaurs**, vice-président du conseil;

◆ **Desroys du Roure**, administrateur;

**Odier**, administrateur;

**Bailloud**, administrateur;

**Puerari**, administrateur;

**Herbelot**, secrétaire général.

## Belgium.

### *A.* — CONTINENT.

### I. — Lines of the State or worked by the State.

*Etat belge (Chemins de fer de l')* (4 640 k.) :

◆ **Tondelier*** (already named);

◆ **Bruneel*** (ibid.);

◆ **Hanrez*** (ibid);

◆ **Corteil*** (ibid.);

◆ **De Rechter*** (ibid.);

◆ **Braem*** (ibid.);

◆ **Lamalle*** (ibid.);

◆ **Golard*** (ibid.);

◆ **Willem*** (ibid.);

◆ J. **Verdeyen*** (ibid.);

◆ **Minsart*** (ibid.).

*Braine-le-Comte à Gand (Chemin de fer de)* (65 k.).

*Eecloo à Bruges (Chemin de fer d')* (28 k.) :

◆ A. **Paternotte**, administrateur-délégué.

*Tournay à Jurbise et Landen à Hasselt (Chemin de fer de)* (46 k.) :

◆ L. **Le Roy**, vice-président.

### .II. — Private lines.

*Chimay (Chemin de fer de)* (61 k.).

*Malines-Terneuzen (Chemin de fer international de)* (68 k.) :

◆ A. **Verwilghen**, administrateur-délégué.

*Nord français (Chemin de fer du)* (lignes Nord-Belges) (170 k.) :

M. **Griolet**, administrateur;
R. **Lisle**, administrateur;
◆ G. **Philippe***, inspecteur général (membre de la Commission permanente).

### III. — Secondary lines of the State.

*Vicinaux (Société nationale des chemins de fer)* (4 095 k.) :

◆ M. **Levie**, président du conseil d'administration;
◆ E. **Gerard***, administrateur (vice-président de la Commission permanente et rapporteur);
◆ J. **Vanderlinden**, administrateur;
◆ H. **Genard**, administrateur;
◆ H. **Debarsy**, administrateur;
◆ H. **Caufriez**, directeur général;
◆ G. **Lembourg**, secrétaire général;
◆ L. **Jacobs**, ingénieur en chef, directeur.

### IV. — Secondary private lines.

*Compagnie belge des chemins de fer et d'entreprises* (300 k.) :

◆ **Cayphas**, secrétaire général;
◆ A. **Fiedler**, ingénieur.

*Economiques (Société générale de chemins de fer)* (116 k.) :

◆ G. **Crombé**, administrateur;
◆ E. **Guillon**, administrateur.

*Liége-Seraing et extensions (Railways économiques de)* (20 k.) :

◆ P. **Beyaert**, ingénieur, directeur-gérant.

### V. — Other companies.

*Compagnie internationale des wagons-lits et d grands express européens* (4 664 essieux à voyageurs 576 essieux à marchandises) :

◆ A. **Neef**, directeur;
◆ A. **Noblemaire**, directeur de l'exploitation générale;
◆ Le baron R. **Snoy**, sous-directeur de l'exploitation g nérale;
◆ **Wildhagen**, directeur régional à Rome;
**Doassans**, ingénieur en chef du service des études des constructions;
de **Saint-James**, ingénieur en chef du service des at liers et de l'entretien;
◆ F. **Woytt**, ingénieur en chef adjoint du service d études et des constructions;
◆ **Muntz**, ingénieur en chef adjoint du service des atelie et de l'entretien.

*Compagnie auxiliaire internationale de chemins de f* (2 584 essieux à marchandises) :

◆ F. **Sieges**, administrateur-délégué;
◆ G. **Sieges**, directeur.

### *B.* — COLONY.

*Bas-Congo au Katanga (Compagnie du chemin de f du)* (750 k.) :

◆ N. **Cito**, administrateur-délégué;
◆ E. **Felsenhart**, commissaire.

*Congo (Compagnie du chemin de fer du)* (400 k.) :

L. **Goffin**, administrateur-délégué;
◆ G. **Geerts**, ingénieur-directeur;
◆ E. **Goffin**, ingénieur, chef du service technique.

## Brazil.

*Est brésilien (Compagnie des chemins de fer de l* (1 934 k.) :

◆ **Vee**, administrateur;
E. **Petit**, membre du comité de direction;
◆ **Lazard**, administrateur;
◆ **Morland**, secrétaire général;
◆ **Courau**, membre du comité de direction;
◆ **Beck**, ingénieur, secrétaire du comité de direction.

*Great Western of Brazil Railway* (1 617 k. [1 0 miles]) :

F. **Holt***, chairman (délégué du Entre Rios Railway)
H. **Tattam**, secretary.

## Chili.

*Antofagasta (Chili) and Bolivia Railway* (1 318 k. [819 miles]) :

A. W. **Bolden,** managing director;
E. W. Richard **Bolden,** assistant.

*Nitrate Railways* (631 k. [392 miles]) :

◆ Sir David **Wilson-Barker,** R. D., R. N. R., director;
G. **Theunis,** C. M. G., director.

*Taltal Railway* (290 k. [180 miles]) :

◆ D. R. **Finnis,** secretary.

## China.

### I. — Lines of the State.

*Etat chinois (Chemins de fer de l').*

*Ligne de Pékin-Hankow* (1 200 k.).

*Ligne du Lung Hai* (1 800 k.) :

◆ **Bonnevay,** ancien ingénieur en chef du chemin de fer du Lung Hai;

◆ **Grené,** ancien ingénieur en chef au service des ports du Hai Tchou;

◆ **Marchand,** ingénieur en chef de la traction et du matériel du chemin de fer de Pékin-Hankow;

◆ **Shen Tcheng,** ingénieur au chemin de fer de Pékin-Hankow;

◆ C. **Blaise,** inspecteur principal de l'exploitation au chemin de fer de Pékin-Hankow.

*South Manchuria Railway* (2 979 k. [1 851 miles]) :

◆ J. **Fuzine,** chief engineer of new lines;
◆ H. **Nonaka,** mechanical engineer;
◆ T. **Kimura,** traffic agent;
◆ S. **Fukumi,** engineer;
◆ S. **Sato,** passenger traffic manager.

### II. — Private line.

*Chemins de fer et tramways en Chine (Compagnie générale de)* (551 k.) :

◆ J. **Jadot,** administrateur-délégué;
H. **Seymat,** directeur;
◆ P. **Pasquier,** sous-directeur.

## Costa-Rica.

*Costa Rica Railway* (306 k. [190 miles]).

## Denmark.

### I. — Lines of the State.

*Etat danois (Chemins de fer de l')* (2 401 k.) :

◆ T. A. **Alstrup*,** directeur général (membre de la Commission permanente et délégué du gouvernement danois);

◆ A. **Floor,** directeur, chef du département des machines et de la traction;

◆ N. I. U. **Andersen,** directeur, chef du département de comptabilité et des tarifs;

◆ H. **Flensborg,** chef constitué du département de la voie;

◆ L. G. C. L. **Eir,** chef de district;
◆ C. I. E. **Rasmussen,** chef des ateliers centraux;
◆ R. N. **Zachariae,** chef de bureau;
◆ P. M. **Bülow*,** ingénieur, chef de bureau (rapporteur).

### II. — Private lines.

*Aalborg Privatbaner* (259 k.) :

◆ C. A. **Rammeskov,** directeur de l'exploitation.

*Est de Seeland (Chemin de fer de l')* (47 k.) :

◆ C. **Tiemroth,** secrétaire de direction.

*Fionie méridionale (Chemins de fer de la)* (216 k.) :

S. **Neumann,** membre de la direction;
◆ J. P. **Stensballe,** directeur gérant.

*Lolland-Falster (Chemin de fer de)* (104 k.) :

◆ L. A. **Damm,** président;
◆ F. S. **Agerskov,** chef de l'exploitation.

## Egypt.

*Etat égyptien (Chemins de fer de l')* (3 181 k.).

## Spain.

*Andalous (Compagnie des chemins de fer)* (1 703 k.) :

**Combet de Larenne,** directeur général;
◆ **Rennes,** sous-directeur;
**Rahola,** ingénieur en chef des services techniques;
◆ **Detraux,** chef de l'exploitation.

*Aragon (Chemin de fer central de)* (302 k.) :

◆ A. **Stoclet,** administrateur;
J. **Zeimet,** secrétaire.

*Catalans (Compagnie générale de chemins de fer)* (140 k.) :

◆ A. **Pirard,** administrateur-délégué;
◆ J. **d'Hertoghe,** directeur général.

*Great Southern of Spain Railway* (168 k.) :

◆ G. L. **Boag**, general manager.

*Madrid à Cacérès et au Portugal et Ouest de l'Espagne (Compagnie d'exploitation des chemins de fer de)* (777 k.) :

P. **Rózpide**, directeur adjoint;

J. Gil de **Biedma**, secrétaire du conseil d'administration.

*Madrid à Saragosse et à Alicante (Compagnie des chemins de fer de)* (3 663 k.) :

E. **Maristany***, directeur général (membre de la Commission permanente);

◆ C. **Maristany**, administrateur;

◆ N. **Süss**, ingénieur, conseil du comité de Paris;

◆ R. **Peironcely**, directeur adjoint;

D. **Muguruza**, sous-directeur;

E. **Alfonso**, sous-directeur;

◆ B. **Beamonte**, ingénieur en chef de la voie (réseau Catalan);

◆ L. **Salto**, ingénieur, sous-chef du matériel et de la traction;

◆ M. Maria **Arrillaga**, ingénieur en chef adjoint du mouvement.

*Medina del Campo à Salamanca (Compagnie des chemins de fer de)* (77 k.) :

L. **Cocagne**, administrateur-délégué.

*Medina del Campo à Zamora et Orense à Vigo (Chemins de fer de)* (297 k.) :

◆ A. **Massó Casañas**, président du conseil d'administration et directeur de la Compagnie;

◆ J. **Gari Cañas**, membre du conseil d'administration.

*Nord de l'Espagne (Compagnie des chemins de fer du)* (3 692 k.) :

Le marquis de **Alonso Martinez**, président du conseil d'administration;

◆ Le marquis de **Caviedes**, vice-président du comité de Paris;

◆ T. R. **Valarino**, administrateur;

V. **Gorbena**, administrateur;

◆ **Olanda**, directeur-adjoint;

◆ H. **Grasset**, sous-directeur;

◆ **Ballesteros**, ingénieur en chef de la voie et des travaux;

◆ F. de **Vargas***, ingénieur en chef du matériel et de la traction (rapporteur);

◆ A. **Delu**, ingénieur du matériel;

◆ E. **Gabbia***, chef de section de la voie et des travaux (secrétaire de section).

*Utrillas (Chemin de fer et mines de)* (127 k.) :

◆ M. **Baselga y Ramirez**, président du conseil d'adm nistration;

◆ S. **Baselga y Ramirez**, député, directeur-gérant.

## United States of America.

*American Railway Association* (3 218 k. [2 00 miles]) :

D. **Willard**, chairman of the board, president, Balt more & Ohio Railroad;

R. H. **Aishton***, president (membre de la Commissio permanente);

Dewitt **Cuyler**, director, Pennsylvania Railroad, chai man Association Railway Executives;

◆ W. W. **Atterbury***, vice-president in charge of operation, Pennsylvania Railroad (membre de la Commissio permanente et délégué du gouvernement américain);

◆ G. **Gibbs***, chairman electrical section, chief enginee of electric traction, Long Island Railroad (rapporteur)

◆ J. E. **Fairbanks**, general secretary;

C. W. **Crawford***, chairman, general committee section V, Transportation (rapporteur);

◆ L. A. **Downs**, chairman, Division IV. Engineering, vice-president and general manager, Central of Georgia Railway;

◆ W. J. **Tollerton***, chairman, mechanical division (rapporteur);

◆ Dr. D. Z. **Dunott**, chairman, medical and surgica section;

◆ W. B. **Causey**.

*Atlanta & West Point Railroad and the Western Railway of Alabama* (352 k. [225 miles]).

*Baltimore & Ohio Railroad* (7 170 k. [4 455 miles])

D. **Willard***, president (délégué de l'American Rail way Association);

E. **Stimson***, chief engineer maintenance (rapporteur

*Bessemer & Lake Erie Railroad* (349 k. [217 miles])

*Buffalo & Susquehanna Railroad* (407 k. [253 miles])

◆ C. **Yarnall**, director.

*Central of Georgia Railway* (3 083 k. [1 916 miles])

◆ L. A. **Downs***, vice-president and general manager (délégué de l'American Railway Association).

*Central Vermont Railway* (863 k. [536 miles]).

*Chicago, Peoria & St. Louis Railway* (378 k. [23 miles]).

*Delaware & Hudson Company* (1 258 k. [782 miles])

L. F. **Loree***, president (membre de la Commission pe manente);

W. H. **Williams***, vice-president (rapporteur).

*Delaware, Lackawanna & Western Railroad* (1 577 k. [980 miles]) :

◆ A. **Fletcher**, consulting engineer.

*Elgin, Joliet & Eastern Railway* (340 k. [211 miles]) :

A. F. **Banks***, president (rapporteur).

*Erie Railroad* (3 634 k. [2 258 miles]).

*Hocking Valley Railway* (552 k. [343 miles]).

*Illinois Central Railroad* (7 725 k. [4 800 miles]) :

◆ A. S. **Baldwin***, vice-president (rapporteur);
◆ H. **Pattison**, electrical engineer;
◆ D. **Rose**, European traffic manager.

*Kansas City Southern Railway* (1347 k. [837 miles]) :

◆ **Schaff**, consulting engineer.

*Lehigh & New England Railroad* (325 k. [202 miles]) :

◆ R. H. **Wilbur**, vice-president & general manager;
W. J. **Turner**, vice-president & general counsel;
H. H. **Pease**, secretary and treasurer.

*Lehigh Valley Railroad* (2 251 k. [1 399 miles]) :

◆ W. H. **Woodin**, consulting engineer.

*Long Island Railroad* (634 k. [394 miles]) :

R. **Peters**, president;
◆ G. **Gibbs***, chief engineer of electric traction (rapporteur et délégué de l'American Railway Association).

*New York Central Railroad* (5 954 k. [3 700 miles]) :

◆ G. L. **Bourne**, consulting engineer.

*New York, Chicago & St. Louis Railroad* (842 k. [523 miles]).

*Norfolk & Western Railway* (3 573 k. [2 220 miles]).

*Pennsylvania System* (16 949 k. [10 532 miles]) :

◆ W. W. **Atterbury***, vice-president in charge of operation (membre de la Commission permanente et délégué du gouvernement américain et de l'American Railway Association);
Dewitt **Cuyler***, director (délégué de l'American Railway Association);
W. C. **Cushing***, engineer standards (rapporteur);
◆ J. V. B. **Duer**, electrical engineer;
◆ W. B. **Wood**, general superintendent, Illinois Division;
◆ R. C. **Morse**, Jr., superintendent freight transportation, Eastern Region;
◆ J. O. **Hackenberg**, superintendent, Buffalo Division.

*Philadelphia & Reading Railway* (2 546 k. [1 582 miles]) :

◆ A. T. **Dice**, president;
C. H. **Ewing***, vice-president (rapporteur);
◆ F. M. **Falck**, general manager.

*Pittsburgh, Shawmut & Northern Railroad* (338 k. [210 miles]) :

H. S. **Hastings**, receiver.

*Richmond, Fredericksburg & Potomac Railroad* (132 k. [82 miles]).

*St. Louis Southwestern Railway* (2 538 k. [1 577 miles]).

*Southern Railway* (10 560 k. [6 562 miles]) :

F. **Harrison***, president (membre de la Commission permanente).

*Staten Island Rapid Transit Railway* (55 k. [34 miles]).

*Ulster & Delaware Railroad* (208 k. [129 miles]).

## France, Algiers, Tunis and Colonies.

### *A.* — FRANCE.

### I. — Lines of the State.

*Etat français (Chemins de fer de l')* (9 002 k.) :

◆ **Dejean**, directeur;
◆ **Payet**, chef du service de l'exploitation;
◆ **Direz**, sous-chef de l'exploitation;
◆ **Polart**, ingénieur au service de l'exploitation;
◆ **Nasse**, chef du service du matériel et de la traction;
◆ **Tainturier**, ingénieur principal au service électrique;
◆ **Haffner**, ingénieur principal du matériel;
◆ **Bauër**, chef du service de la voie et des bâtiments;
◆ **Dreyfuss**, ingénieur en chef adjoint du service de la voie et des bâtiments;
◆ **Duplaix**, ingénieur en chef adjoint du service de la voie et des bâtiments;
◆ **Perrier**, chef du service de la construction des lignes nouvelles.
◆ **Dubois**, ingénieur en chef de l'office central d'études de matériel de chemins de fer.

*Alsace et de Lorraine (Chemins de fer d')* (1 969 k.) :

◆ **Peychez**, directeur;
◆ **Terme**, sous-directeur;
◆ **Ertzbischoff**, ingénieur en chef de l'exploitation;
◆ **Regnauld**, ingénieur en chef de la construction;
◆ **Jac**, secrétaire général;
◆ **Pader**, ingénieur en chef adjoint de l'exploitation.

### II. — Main lines.

*Ceinture de Paris (Chemin de fer de)* (158 k.) :

◆ **Robaglia**, ingénieur en chef des services;
◆ A. **Bernard**, chef de l'exploitation.

*Est (Compagnie des chemins de fer de l')* (5 027 k.) :

◆ **Girod de l'Ain**, administrateur;

**Weiss***, administrateur (membre de la Commission permanente);

◆ **Gérardin**, directeur honoraire;

◆ **Riboud**, directeur;

◆ **Brisse**, ingénieur en chef de l'exploitation;

◆ **Gruson**, secrétaire général;

◆ **Duchatel**, ingénieur en chef du matériel et de la traction;

◆ **Biard***, ingénieur en chef honoraire du matériel et de la traction (rapporteur);

◆ **Henry***, ingénieur en chef de la voie et des travaux (rapporteur);

◆ E. **Labarre**, ingénieur en chef de la traction.

◆ **Tintant**, ingénieur principal de la 1^re^ division.

*Midi (Compagnie des chemins de fer du)* (4 081 k.) :

◆ G. **Teissier**, président du conseil d'administration;

◆ **d'Eichthal**, vice-président du conseil d'administration;

◆ **Paul**, directeur;

◆ **Gufflet**, chef de l'exploitation;

◆ **Charron***, ingénieur en chef adjoint au chef de l'exploitation (rapporteur);

◆ **Bachellery**, ingénieur en chef du matériel et de la traction;

◆ **Godard**, ingénieur en chef de la construction et des lignes nouvelles;

◆ **Couvreux**, ingénieur en chef adjoint du service de la voie;

◆ **Ledoux**, ingénieur principal des services techniques.

*Nord (Compagnie du chemin de fer du)* (3 805 k.) :

G. **Griolet***, vice-président du conseil d'administration (membre de la Commission permanente);

◆ **Moutier***, ingénieur, sous-chef de l'exploitation chargé des services techniques (rapporteur);

◆ **Paris***, ingénieur en chef adjoint de l'entretien (rapporteur);

**Vallon**, administrateur;

◆ M. de **Waru**, secrétaire du comité de direction;

◆ **Javary**, ingénieur en chef de l'exploitation;

◆ **Brévillé**, ingénieur en chef du matériel et de la traction;

◆ **Tettelin**, ingénieur en chef des travaux et de la surveillance;

◆ **Soulez**, sous-chef de l'exploitation chargé du personnel;

◆ **Arnould**, ingénieur principal de la traction;

◆ **Cambournac**, ingénieur en chef des études, matériel des voies et bâtiments.

*Orléans (Compagnie du chemin de fer d')* (7 793 k.) :

◆ **Roume**, administrateur;

◆ **Bénac**, administrateur;

◆ **Heurteau***, administrateur (membre de la Commission permanente);

◆ **Richemond**, administrateur;

◆ **Mange**, directeur;

◆ **Paul-Dubois**, sous-directeur;

◆ **Henry-Gréard***, chef de l'exploitation (rapporteur)

◆ **Epinay**, sous-chef de l'exploitation;

◆ **Balling**, ingénieur en chef du service central de l voie;

◆ **Jullien***, ingénieur en chef de la voie et des travau (rapporteur);

◆ **Lacoin***, ingénieur en chef du matériel et de la traction (rapporteur);

◆ **Sabouret***, ingénieur en chef adjoint au directeur (rapporteur);

◆ **Parodi**, ingénieur en chef des services électriques.

*Paris à Lyon et à la Méditerranée (Compagnie de chemins de fer de)* (9 795 k.) :

**Perouse***, vice-président du conseil d'administratio (membre de la Commission permanente);

◆ **Mauris***, directeur général honoraire, administrateu (membre de la Commission permanente);

◆ **Cordier**, administrateur;

**Margot**, directeur général;

**Jourdain***, ingénieur en chef adjoint à la direction générale (rapporteur);

**Mugniot**, ingénieur en chef du service de l'exploitation

**Prudent***, inspecteur général de l'exploitation (rapporteur);

◆ **Vallantin**, ingénieur en chef du service du matériel e de la traction;

◆ **Japiot**, ingénieur en chef adjoint du service du matériel et de la traction;

◆ **Lancrenon**, ingénieur en chef du matériel;

◆ **Quinquet**, ingénieur en chef du service de la voie;

◆ de **Boulongne**, ingénieur en chef des constructions métalliques.

### III. — Secondary lines.

*Beaujolais (Compagnie des chemins de fer du)* (91 k.)

◆ P. **Liénart**, administrateur.

*Cambrésis (Compagnie des chemins de fer du* (120 k.) :

◆ H. **Chevalier**, président du conseil d'administration

◆ L. **Rey**, administrateur-délégué.

*Chauny à Saint-Gobain (Chemin de fer de)* (15 k.)

*Côtes du Nord (Compagnie des chemins de fer des* (219 k.) :

◆ **Pédron**, directeur.

*Départementaux (Chemins de fer)* (1 427 k.) :

◆ **Goyard**, directeur;
**A. Zens**, secrétaire général;
◆ **Grellier**, ingénieur en chef;
◆ **M. Béghin**, ingénieur en chef de l'exploitation;
**P. Béghin**, ingénieur en chef adjoint de l'exploitation.

*Départementaux de l'Aisne (Compagnie des chemins le fer)* (200 k.) :

**P. Jourdain**, administrateur-directeur.

*Départementaux des Bouches du Rhône (Régie des hemins de fer)* (175 k.) :

**Bourgougnon**, président du conseil d'administration;
◆ **Perdrix**, directeur-adjoint.

*Départementaux du Tarn (Compagnie des chemins le fer)* (150 k.) :

◆ **G. Lemonnier**, administrateur, directeur général;
◆ **L. Aubry**, inspecteur des exploitations.

*Economiques (Société générale des chemins de fer)* (2 555 k.) :

◆ **F. Berthelier**, directeur;
**J. Virlet**, directeur adjoint;
**A. Delille**, ingénieur en chef de la direction;
◆ **J. E. Michaut**, ingénieur en chef de la traction;
◆ **G. Level**, inspecteur principal attaché à la direction.

*Economiques du Nord (Chemins de fer)* (365 k.) :

**A. de Wandre**, ingénieur, administrateur-délégué;
◆ **M. Bouteau**, ingénieur, administrateur.

*Est de Lyon (Chemins de fer de l')* (104 k.) :

**E. Dubreuil**, ingénieur aux services techniques;
**C. Duval**, ingénieur, chef du service électrique.

*Grande Banlieue (Chemins de fer de)* (240 k.) :

◆ **J. Monard**, ingénieur;
◆ **J. Chaumet**, chef des services de publicité.

*Landes (Société anonyme des voies ferrées des)* (363 k.).

*Meusienne de chemins de fer (Compagnie)* (168 k.) :

**A. Fayard**, président;
◆ **C. Pattin**, administrateur.

*Saint-Quentin à Guise (Chemin de fer de)* (65 k.) :

**R. Jourdain**, président du conseil d'administration.

*Saône-et-Loire (Chemins de fer de)* (192 k.) :

◆ **C. Renard**, ingénieur en chef;
◆ **L. Guillon**, chef des services de traction.

*Somain à Anzin et à la frontière belge (Chemin de fer de)* (34 k.) :

◆ **Hecquet**, ingénieur en chef.

*Sud de la France (Chemins de fer du)* (570 k.) :

◆ Le docteur **Just**, administrateur.

*Sud-Ouest (Chemins de fer du)* (400 k.) :

Le général **Renard**, président du conseil d'administration;
◆ **C. Sapin**, administrateur-délégué;
◆ **A. Godon**, chef du service des bâtiments.

*Tramways de l'Ain (Régie départementale des)* (436 k.) :

**Comte**, président du conseil d'administration;
**Varvier**, ingénieur en chef des ponts et chaussées, administrateur;
◆ **Mallez**, directeur.

*Tramways départementaux des Deux-Sèvres (Compagnie des)* (198 k.) :

◆ **G. Tartary**, ingénieur des arts et manufactures, administrateur-délégué;
**A. de Thannberg**, administrateur, secrétaire général.

*Tramways de l'Indre (Compagnie des)* (198 k.) :

◆ **E. Seydoux**, président du conseil d'administration;
◆ **Andriveau**, ingénieur des arts et manufactures, administrateur.

*Vicinaux (Compagnie générale des chemins de fer)* (390 k.) :

**L. Bourdeaux**, directeur de l'exploitation du réseau de la Haute-Saône;
**R. Masson**, directeur de l'exploitation du réseau du Jura.

*Voies ferrées d'intérêt local (Compagnie générale de)* (513 k.) :

◆ **F. Level***, directeur (rapporteur);
◆ **L. Fraud**, secrétaire de la direction;
◆ **A. Hagneaux**, ingénieur adjoint de l'exploitation.

*Yonne (Chemins de fer d'intérêt local de l')* (142 k.) :

**A. Fauqueux**, ingénieur-conseil;
◆ **H. Sapin**, agent commercial.

## *B.* — ALGIERS AND TUNIS.

*Algériens de l'Etat (Chemins de fer)* (2 532 k.) :

**Barbedette**, président du conseil de réseau;
**Raby**, vice-président du conseil de réseau;
**Joly**, membre du conseil de réseau;
**Rouzaud**, directeur;

**Côme**, sous-directeur;

**Jouaville**, chef du service de l'exploitation;

**Guillet**, chef du service du matériel et de la traction;

◆ **Bidaut**, chef du service de la voie et des bâtiments;

◆ **Tujague**, chef du service-adjoint de la voie et des bâtiments.

*Algériens de la Compagnie P.-L.-M. (Chemins de fer)* (513 k.) :

◆ **Luuyt**, sous-directeur;

**Verlant**, directeur de l'exploitation;

◆ **Bonnevay**, ingénieur attaché au service central de l'exploitation;

◆ **Séjourné**, sous-directeur.

*Bône-Guelma et prolongements (Compagnie des chemins de fer de)* (1 550 k.) :

**Trélat**, président du conseil d'administration;

◆ C. **Ferrand**, administrateur;

E. **Herscher**, administrateur;

J. **Lacour-Gayet**, secrétaire général;

A. du **Beaufret**, sous-directeur;

R. **Debize**, ingénieur chef du service du matériel et de la traction.

*Gafsa (Compagnie des Phosphates et du Chemin de fer de)* (441 k.) :

◆ M. **Pellé**, administrateur, directeur général;

◆ W. **d'Eichthal**, administrateur;

**Durandeau**, sous-directeur du chemin de fer de Sfax-Gafsa.

## C. — COLONIES AND PROTECTORATES.

### Réunion Island.

*Réunion (Chemin de fer de la)* (127 k.) :

◆ **Boutteville**, inspecteur général des ponts et chaussées et des travaux publics des colonies, président de la Commission de surveillance du chemin de fer et port de la Réunion;

**Coste**, directeur.

### Senegal.

*Dakar à Saint-Louis (Chemin de fer de)* (264 k.) :

◆ L. **Lorieux**, administrateur.

### Asia minor.

*Damas-Hamah et prolongements (Chemin de fer de)* (480 k.) :

P. **Blanche**, administrateur-délégué;

◆ Le comte J. de **Bouthillier-Chavigny**, administrateur;

R. **Marteaux**, directeur de l'exploitation.

*Smyrne-Cassaba et prolongement (Chemin de fer de* (701 k.) :

◆ J. P. **Monod**, vice-président du conseil d'administr tion;

◆ P. **Bourlon de Sarty**, administrateur;

◆ L. **Chenut**, ingénieur du service central;

A. **Scala**, directeur de l'exploitation.

# The United Kingdom, India, protectorates and Colonies.

## A. — THE UNITED KINGDOM.

### I. — Main companies.

*Caledonian Railway* (1 793 k. [1 114 miles]) :

◆ R. **Glyn**, M. C., M. P., director;

◆ D. A. **Matheson**, general manager;

W. A. **Paterson**, chief engineer.

*Glasgow & South Western Railway* (771 k. [48 miles]) :

The Right Hon. Lord **Glenarthur**, chairman;

The Right Hon. Sir Herbert E. **Maxwell**, Barone director;

◆ D. **Cooper**, general manager;

◆ J. **Robinson**, goods manager.

*Great Central Railway* (1 596 k. [992 miles]) :

◆ Right Hon. The Earl of **Kerry**, director;

◆ Sir Sam **Fay**, general manager;

◆ W. **Clow**, superintendent of the line;

◆ J. G. **Robinson**, chief mechanical engineer;

◆ C. **Travis**, assistant, traffic department;

◆ L. R. **Christie**, continental manager.

*Great Eastern Railway* (1 711 k. [1 063 miles]) :

◆ A. W. **Maconochie**, director;

◆ Major General Sir Henry W. **Thornton**, K. B. E., g neral manager;

◆ H. H. **Mauldin**, acting superintendent of operation;

◆ A. L. **Gibson**, assistant continental traffic manage

◆ G. **Mayer***, attached to the Company (secrétaire section);

◆ H. W. **Firth**, officer;

◆ A. **Aronovici**, general agent for Europe.

*Great Northern Railway* (1 596 k. [992 miles]) :

The Rt. Hon. Sir Frederick **Banbury**, Bart., M. chairman of directors;

The Hon. F. S. **Jackson**, M. P., director;

◆ C. H. **Dent**, general manager;

◆ H. N. **Gresley**, locomotive engineer;

◆ A. J. **Brickwell**, surveyor;

◆ C. J. **Selway**, superintendent of the line;

◆ C. J. **Brown***, chief engineer (rapporteur).

*Great Western Railway* (4 269 k. [2 653 miles]) :

The Rt. Hon. Viscount **Churchill***, G. C. V. O., chairman (membre de la Commission permanente);

Sir S. Ernest **Palmer**, Bart, deputy chairman;

◆ F. J. C. **Pole**, general manager;

◆ C. B. **Collett**, deputy chief mechanical engineer;

◆ W. W. **Grierson***, chief engineer (rapporteur);

◆ E. **Lowther**, chief goods manager;

◆ R. H. **Nicholls**, superintendent of the line;

◆ H. **Spiller**, continental representative;

◆ J. A. **Kay**, attached to the operating department;

◆ R. **Smith**, electrical engineer.

*Lancashire & Yorkshire Railway* (1 675 k. [1 041 miles]) :

E. B. **Fielden**, chairman;

◆ A. **Watson***, general manager (membre de la Commission permanente);

◆ W. H. **Coomber**, Divisional engineer, Northern diviion;

◆ A. **Davies**, general superintendent, Northern division;

◆ G. **Hughes***, chief mechanical and electrical engineer rapporteur);

◆ R. C. **Irwin**, secretary;

◆ H. **Marriott**, assistant to general manager.

*London, Brighton & South Coast Railway* (784 k. 487 miles]) :

◆ C. L. **Morgan**, C. B. E., director;

◆ Sir William **Forbes**, general manager;

◆ Sir Philip **Dawson**, M. I. C. E., M. I. E. E., electrical ngineer;

◆ C. **Cooper**, continental traffic agent.

*London & North Western Railway* (3 283 k. [2 040 miles]) :

Hon. C. N. **Lawrence**, chairman;

◆ A. **Watson***, general manager (membre de la Commission permanente et délégué du Lancashire & Yorkshire Railway);

◆ E. F. C. **Trench***, chief engineer (rapporteur);

L. W. **Horne**, general superintendent, Southern division;

◆ J. R. **Ball**, chief of estate department;

S. H. **Hunt**, chief goods manager;

◆ H. H. **Waters**, continental representative at Paris;

◆ F. **Engel**, attached to the general manager's department.

*London & South Western Railway* (1 664 k. [1 034 miles]) :

◆ Brigadier General H. W. **Drummond** C. M. G., chairman;

◆ The Rt. Hon. Sir Evelyn **Cecil***, G. B. E., M. P., director (membre de la Commission permanente);

◆ Sir Herbert A. **Walker***, K. C. B., general manager (rapporteur);

◆ A. W. **Szlumper**, chief engineer.

*Midland Railway* (2 224 k. [1 382 miles]) :

◆ C. **Booth**, chairman;

◆ G. **Behrens***, director (membre de la Commission permanente);

Sir Guy **Granet***, director (membre de la Commission permanente);

◆ F. **Tatlow**, C. B. E., general manager;

◆ J. H. **Follows**, C. B. E., general superintendent;

◆ J. **Briggs**, C. B. E., engineer in chief;

◆ Sir Henry **Fowler***, K. B. E., chief mechanical engineer (rapporteur);

◆ R. W. **Reid***, C. B. E., carriage & wagon superintendent (rapporteur);

◆ H. F. **Loney**, O. B. E., chief goods manager;

◆ W. N. **Bancroft**, secretary;

◆ A. W. **Allen**, mineral manager.

*Midland Great Western Railway of Ireland* (866 k. [538 miles]) :

Sir Walter **Nugent**, Bart., deputy chairman;

A. **Jackson**, director;

M. F. **Keogh**, general manager;

P. A. **Hay**, secretary.

*North British Railway* (2 218 k. [1 378 miles]) :

◆ The Earl of **Elgin**, C. M. G., director;

◆ A. B. **Gilroy**, director;

◆ A. R. **Gray**, director.

*North Eastern Railway* (2 828 k. [1 757 miles]) :

C. F. **Bengough**, chief engineer.

*South Eastern & Chatham Railway* (1 038 k. [645 miles]) :

Sir Francis **Dent***, director (membre de la Commission permanente);

The Hon. Sir Arthur H. **Yorke**, C. B., director;

P. C. **Tempest**, C. B. E., general manager;

◆ R. E. L. **Maunsell**, C. B. E., chief mechanical engineer;

◆ G. **Ellson**, resident engineer;

◆ F. A. **Brant**, continental traffic assistant to the general manager;

◆ C. **Grillo***, general agent for Italy (secrétaire de section).

## II. — Other railways.

*Barry Railway* (103 k. [64 miles]) :

◆ T. **Evans**, director;

◆ T. H. **Rendell**, director.

*Cambrian Railways* (483 k. [300 miles]) :

◆ C. B. O. **Clarke**, director;
N. W. **Apperley**, director;
S. **Williamson**, secretary & general manager.

*Cheshire Lines Committee* (220 k. [137 miles]) :

◆ J. E. **Charnley**, manager;
◆ A. P. **Ross**, engineer.

*City & South London Railway* (11 k. [7 miles]) :

◆ A. R. **Cooper**, chief engineer.

*Cork, Bandon & South Coast Railway* (151 k. [94 miles]) :

◆ J. M. **Sugrue**, director.

*Dublin & South Eastern Railway* (251 k. [156 miles]) :

◆ Sir Thomas H. G. **Esmonde**, Baronet, chairman;
◆ M. **Maguire**, general manager.

*Furness Railway* (275 k. [171 miles]) :

L. **Speakman**, general manager;
◆ D. L. **Rutherford**, locomotive, carriage and wagon superintendent and engineer.

*Great Northern Railway (Ireland)* (896 k. [557 miles]) :

◆ J. C. W. **Madden**, director;
◆ F. A. **Campion**, chief engineer;
◆ G. T. **Glover**, locomotive engineer;
◆ J. B. **Stephens**, secretary and assistant general manager.

*Great North of Scotland Railway* (538 k. [334 miles]) :

◆ A. **Duffus**, chairman of directors;
◆ Sir John H. **Irvin**, K. B. E., director;
◆ G. **Davidson**, general manager;
◆ T. E. **Heywood**, locomotive superintendent.

*Great Southern & Western Railway* (1 820 k. [1 130 miles]) :

Sir W. J. **Goulding**, Bart., P. C., D. L., chairman;
H. A. **Henry**, director;
Sir Henry **Forde**, J. P., director;
C. D. **Evans**, director;
E. A. **Neale**, general manager;
R. **Crawford**, secretary.

*Highland Railway* (792 k. [492 miles]) :

◆ J. E. B. **Baillie**, director.

*Hull & Barnsley Railway* (128 k. [78 miles]) :

◆ C. W. **Trotter**, C. B., chairman;
◆ J. H. **Fisher**, J. P., deputy-chairman.

*Isle of Man Railway* (74 k. [46 miles]).

*Kent, Somerset & Shropshire Light Railway Grou* (153 k. [95 miles]) :

◆ H. F. **Stephens**, managing director;
◆ W. A. **Jepson**, director.

*Liverpool Overhead Railway* (16 k. [10 miles]) :

◆ E. J. **Neachell**, engineer & general manager.

*Londonderry & Lough Swilly Railway* (161 k. [10 miles]) :

◆ K. P. **Hunt**, assistant to general manager.

*Metropolitan Railway* (127 k. [79 miles]) :

◆ R. H. **Selbie**, C. B. E., general manager;
◆ C. **Jones**, chief mechanical & electrical engineer.

*Neath & Brecon Railway* (64 k. [40 miles]) :

◆ A. **Beckwith**, O. B. E., A. M. I. C. E., director.

*North Staffordshire Railway* (325 k. [202 miles]) :

◆ F. A. L. **Barnwell**, general manager;
◆ C. G. **Rose**, chief engineer.

*Rhondda & Swansea Bay Railway* (45 k. [28 miles])

*Rhymney Railway* (127 k. [79 miles]).

*Stratford-upon-Avon & Midland Junction Railwa* (105 k. [65 miles]) :

H. **Willmott**, chairman;
◆ S. **Herbert**, deputy chairman.

*Taff Vale Railway* (200 k. [124 miles]).

*Tralee & Dingle Railway* (60 k. [37 miles]) :

J. P. **Tooher**, general manager.

*County Donegal Railways Joint Committee* (201 [125 miles]) :

◆ H. **Forbes**, secretary and traffic manager;
R. M. **Livesey**, engineer and locomotive superinter dent.

*Great Central & Midland Joint Committee* (63 [39 miles]) :

◆ J. **Sayers**, O. B. E., assistant engineer (telegraphs, etc. Midland Railway.

*Great Northern & Great Eastern Joint Committe* (198 k. [123 miles]) :

◆ Sir Frederick **Fison**, Bart., director;
W. J. **Galloway**, director.

*Midland Railways & Great Northern Joint Committee* 95 k. [183 miles]) :

W. **Marriott**, engineer and traffic manager;

J. **Quirey**, accountant, Midland Railway.

*Midland Railways (Northern Counties Committee)* 23 k. [263 miles]) :

J. A. **Torrens**, D. L., chairman of directors;

Viscount **Massereene & Ferrard**, D. S. O., director;

B. **Malcolm**, locomotive engineer and permanent way gineer.

*Railway Clearing House :*

E. R. **Turton**, M. P., chairman;

H. T. **Anstruther**, director;

P. H. **Price**, secretary;

E. G. **Eliot**, solicitor;

E. E. **Painter**, assistant to secretary.

## B. — INDIA, PROTECTORATES AND COLONIES.

### I. — India.

*Bengal Nagpur Railway* (4 338 k. [2 696 miles]) :

A. C. **Carr**, acting agent.

*Bengal & North Western Railway* (3 304 k. [2 053 iles]) :

Sir Henry P. **Burt**, K. C. I. E., R. E., chairman;

E. A. **Neville**, managing director;

T. **Gracey**, R. E., director;

E. **Christian**, director.

*Bombay, Baroda & Central India Railway* (6 316 k. 925 miles]) :

Sir E. Charles K. **Ollivant**, K. C. I. E., deputy chair- an;

J. A. **Bryce**, director;

Sir Henry F. E. **Freeland**, K. C. I. E., R. E., agent in dia;

F. G. **Heaven**, accountant;

W. S. **Fraser**, locomotive superintendent;

N. **Lincoln**, assistant secretary;

F. **Palmer**, consulting engineer.

*Eastern Bengal Railway (State Railway of India)* 797 k. [1 738 miles]) :

H. St. G. **Gilmore**, traffic manager;

A. V. **Hawkins**, C. I. E., deputy traffic manager;

R. B. B. R. **Singh**, deputy chief engineer;

W. R. **Bennet**, signal engineer.

*Great Indian Peninsula Railway* (5 023 k. [3 121 les]).

Sir Charles **Armstrong**, chairman;

E. P. **Goldney**, assistant secretary;

N. L. **Inkson**, district locomotive superintendent.

*Madras & Southern Mahratta Railway* (4 873 k. [3 028 miles]) :

◆ W. V. **Constable**, R. E., chairman;

Sir Donald **Robertson**, K. C. S. I., deputy chairman;

L. R. W. **Forrest**, director;

Sir Walter R. **Lawrence**, Baronet, G. C. I. E., G. C. VO. C. B., director;

◆ L. H. **Kirkness**, D. S. O., O. B. E., district traffic officer;

◆ H. **Lingard**, district engineer.

*North Western Railway (State Railway of India)* (8 883 k. [5 520 miles]) :

◆ V. H. **Boalth**, C. B. E., traffic manager;

◆ J. H. **Smellie**, D. S. O., O. B. E., deputy locomotive superintendent;

◆ C. B. **Barrie**, deputy chief engineer;

◆ E. H. **Keelan**, deputy carriage & wagon superintendent;

◆ F. H. **Budden**, R. E., assistant agent;

◆ A. D. **Green**, deputy traffic manager;

◆ H. H. **Saunders**, M. C., district locomotive superintendent;

◆ F. E. **Cole**, signal engineer.

*Oudh & Rohilkhand Railway* (2 562 k. [1 592 miles]) :

◆ K. M. **Kirkhope**, C. I. E., locomotive & carriage superintendent;

◆ M. S. S. **O'Connor**, traffic manager;

Asad Mohammad **Ali**, assistant traffic superintendent;

Abdul **Bari** Khan, assistant traffic superintendent;

N. W. **Synnott**, district traffic superintendent.

*South Indian Railway* (2 980 k. [1 852 miles]) :

◆ A. W. **Acres**, general traffic manager;

◆ A. H. **Smyth**, electrical and signal engineer.

### II. — South Africa.

*South African Railways & Harbours* (15 274 k. [9 491 miles]) :

◆ C. L. N. **Felling**, chief assistant to the general manager;

◆ T. H. **Watermeyer**, assistant to chief civil engineer;

◆ F. R. **Collins**, D. S. O., advisory engineer;

◆ O. **Zachariah**, publicity agent.

*Mashonaland Railway* (602 k. [374 miles]) :

L. **Oury**, director, manager London Committee.

### III. — West Africa.

*Nigerian Railway* (1 814 k. [1 127 miles]) :

◆ F. H. **Greenhough***, deputy general manager (délégué du gouvernement nigérien);

T. **Otway-Ruthven**, chief mechanical engineer;

◆ C. A. **Cuningham***, chief accountant (délégué du gouvernement nigérien).

### IV. — Australia.

*New South Wales Government Railways* (8 071 k. [5 015 miles]).

*New Zealand Government Railways* (4 838 k. [3 006 miles]).

*South Australia Government Railways* (3 754 k. [2 233 miles]).

### V. — Canada.

*Grand Trunk Railway System* (3 003 k. [1 866 miles]) :

H. G. **Kelley***, president (membre de la Commission permanente et rapporteur).

*Quebec Central Railway* (446 k. [277 miles]).

### VI. — Malay Peninsula.

*Federated Malay States Railways* (1 613 k. [1 014 miles]) :

◆ **Anthony**, general manager and chief engineer;

◆ G. C. **Forbes**, locomotive superintendent.

## Greece.

### I. — Lines of the State.

*Etat hellénique (Chemin de fer de l')* (1 818 k.) :

◆ G. **Delaluque**, ingénieur en chef de l'exploitation;

M. **Joannidès**, ingénieur en chef du service de la voie;

◆ E. **Boulière**, ingénieur en chef du matériel et de la traction.

### II. — Private lines.

*Nord-Ouest de Grèce (Compagnie du chemin de fer du)* (74 k.).

*Thessalie (Compagnie des chemins de fer de)* (233 k.).

## Italy.

### I. — Lines of the State.

*Etat italien (Chemins de fer de l')* (16 164 k.) :

◆ C. **Crova***, ingénieur, directeur général (membre de la Commission permanente, président de la section italienne d'organisation du Congrès);

◆ G. **Grillo***, chef de service principal (membre de la Commission permanente);

◆ N. **Nicoli***, ingénieur, inspecteur supérieur et conseiller d'administration (membre de la section italie
d'organisation du Congrès);

◆ A. **Alessandri***, ingénieur, inspecteur supérieur et c
seiller d'administration (id.);

◆ R. **Gioppo***, ingénieur, chef du service des t
vaux (id.);

◆ V. **Tondelli***, avocat, chef du service du mouvem
et du trafic (id.);

◆ A. **Sapuppo***, ingénieur, chef du service des appro
sionnements (id.);

◆ Q. **Orso***, ingénieur, chef du service du matériel et la traction (id.);

◆ D. **Serani***, ingénieur, chef du service de la comp
bilité (id.);

◆ A. **Mengoni***, avocat, chef du service du cont
tieux (id.);

◆ V. **Margotta***, ingénieur, chef du service de la c
struction (id.);

◆ A. **Donati***, ingénieur, chef du service spécial de l'é
trification (id. et rapporteur);

◆ E. **Talenti***, ingénieur, chef du compartiment de Ro
(membre de la section italienne d'organisation du C
grès);

◆ G. G. **Pietri***, ingénieur, inspecteur supérieur (id.);

◆ A. **Zanotta**, ingénieur, inspecteur supérieur;

C. **Dezza**, avocat, inspecteur supérieur;

◆ F. **Fiori**, ingénieur, inspecteur supérieur;

◆ E. **Franza***, avocat, chef du service du personnel des affaires générales (premier secrétaire de la sect
italienne d'organisation du Congrès);

◆ O. **Viglione**, ingénieur, sous-chef au service
affaires générales;

◆ A. **Schiavon**, ingénieur, chef du compartiment de F
rence;

◆ N. **Giovene***, ingénieur, inspecteur principal au s
vice du personnel et des affaires générales (deuxiè
secrétaire de la section italienne d'organisation du C
grès);

◆ G. **Barbieri***, ingénieur, chef de division au ser
des travaux (rapporteur);

◆ E. **Ehrenfreund***, ingénieur, chef du département
Turin (id.);

◆ F. **Lolli***, ingénieur, chef de division au service
travaux (id.);

◆ R. **Girard**, ingénieur, chef de division au service
constructions à l'Office de Gênes;

◆ L. **Maccallini***, ingénieur, inspecteur principal (r
porteur);

◆ F. **Villa***, ingénieur en chef au service des t
vaux (id.);

◆ G. **Tronconi**, ingénieur, inspecteur principal au
vice des travaux.

◆ A. **Vigna**, ingénieur, chef du compartiment de Mil

B. **Marsili**, ingénieur, inspecteur en chef;

◆ U. **Cattaneo***, ingénieur, chef de l'Institut des ex
riences (membre de la section italienne d'organisat
du Congrès);

### II. — Main lines.

*Méditerranée (Société italienne des chemins de fer de*

(173 k.) :

E. **Lissoni**, chef de service;

J. **Sona**, ingénieur, chef de division.

*Nationale (Société) de chemins de fer et de tramways*

50 k.) :

E. **Scialoja**, président du conseil d'administration;

G. **Ottone***, ingénieur, administrateur-délégué (mem-
e de la section italienne d'organisation du Congrès);

E. **Parisi**, membre du conseil d'administration.

*Nord de Milan (Société du chemin de fer du)* (238 k.) :

R. **Luzzati**, ingénieur, directeur;

U. V. **Mazza**, administrateur.

*Vénitienne (Société) pour la construction et l'exploi-
tion de chemins de fer secondaires en Italie* (558 k.) :

D. **Poli**, directeur;

P. **Giuriati**, ingénieur;

G. **Fattori**, chef de service;

C. **Serafini**, ingénieur, gérant de la direction.

### III. — Secondary lines.

*Apennin central (Société des chemins de fer de l')*

35 k.) :

M. **Berrini**, ingénieur, administrateur-délégué;

H. **Locatelli**, directeur de l'exploitation du chemin de
r Arezzo-Fossato.

*Canavèse (Société du chemin de fer Central et tram-
ys du)* (59 k.) :

M. **Pellegrini**, ingénieur, administrateur-délégué.

*Reggio-Emilia (Société pour les chemins de fer de)*

1 k.) :

G. **Menada**, président du conseil d'administration.

*Sardaigne (Société pour le chemin de fer complémen-
ire de la)* (697 k.) :

S. **Scano**, ingénieur, directeur général;

F. **Marta**, ingénieur, directeur de l'exploitation;

G. **Gandini**, ingénieur, inspecteur;

G. **Luzzatti**, avocat, conseiller d'administration.

*Suzzara-Ferrara (Chemin de fer de)* (82 k.) :

F. **Pisa**, ingénieur, conseiller délégué.

### IV. — Light railways.

*Circumetnea (Chemin de fer) (Société sicilienne de travaux publics)* (114 k.) :

◆ **Natoli**, vice-président-délégué;

◆ **Ghisi**, directeur.

*Emilienne (Société) de chemins de fer, tramways et automobiles* (120 k.) :

◆ E. **Klein**, ingénieur, directeur;

◆ E. **Guastalla**, ingénieur, directeur-adjoint.

*Lombardie et Romagnes (Tramways de)* (175 k.) :

◆ C. **Thonet**, vice-président;

◆ G. de **Miomandre**, directeur.

*Piémontais (Tramways à vapeur)* (180 k.) :

J. **Kessels**, président;

Baron E. **Carton de Wiart**, administrateur.

*Province de Pise (Tramways à vapeur et chemins de fer économiques de la)* (41 k.).

*Rome, Milan, Bologne, etc. (Tramways et chemins de fer économiques)* (31 k.) :

◆ L. **Maryssael**, administrateur.

*Tessin (Chemin de fer du)* (242 k.) :

◆ J. **Van den Savel**, secrétaire du conseil d'administration, directeur;

◆ P. **Giovanola**, directeur des exploitations.

*Turinoise (Société) de tramways et de chemins de fer économiques* (76 k.) :

◆ G. **Salvadori di Wiesenhoff**, ingénieur, administrateur-délégué.

*Vercellesi (Tramways)* (112 k.) :

◆ L. **Cornara**, ingénieur, directeur.

*Vicinaux (Société anonyme pour les chemins de fer)* (136 k.) :

◆ S. **Padovano**, ingénieur, directeur;

◆ A. **Armanni**, ingénieur au service des travaux.

### V. — Other company.

*Fédération des transports* (3 020 k.) :

◆ F. **Tajani***, ingénieur, président de la Fédération des transports (membre de la Commission permanente et vice-président de la section italienne d'organisation du Congrès);

◆ E. **Denti**, ingénieur, directeur de la Société de traction électrique Lombardienne;

◆ A. **Forges Davanzati**, ingénieur, conseiller, délégué de la Société de chemins de fer secondaires méridionaux;

◆ D. **L'Abbate,** ingénieur, directeur des chemins de fer vicinaux;

◆ A. **Ligabue,** directeur des chemins de fer de Val Seriana e Valle Brembana;

◆ A. **Maffezzoli,** ingénieur, directeur des tramways de Capodimento;

◆ I. **Migliau,** ingénieur, directeur de la Société générale de chemins de fer économiques (réseau Biellais);

◆ A. **Pasini,** ingénieur;

◆ E. **Simonetti,** ingénieur, directeur de l'Union italienne des tramways électriques.

## Luxemburg.

*Guillaume-Luxembourg* (*Chemins de fer*) (257 k.) :

T. **Dutreux*,** ingénieur civil, président du conseil d'administration (membre de la Commission permanente);

◆ A. **Dutreux,** ingénieur, administrateur.

*Prince-Henri* (*Chemins de fer et minières*) (250 k.) :

◆ A. **Sorel,** ingénieur, directeur;

## Norway.

### I. — Lines of the State.

*Etat norvégien* (*Chemins de fer de l'*) (2 820 k.) :

◆ C. T. **Holtfodt*,** directeur général (délégué du gouvernement norvégien);

◆ **Hoff,** administrateur;

◆ **Aubert,** administrateur;

◆ **Saxegaard,** directeur;

◆ **Schreiner,** ingénieur en chef.

### II. — Private lines.

*Christiania à Eidsvold* (*Chemin de fer de*) (68 k.).

## Holland.

### A. — CONTINENT.

### I. — Main lines.

*Chemins de fer néerlandais* (*Compagnie pour l'exploitation des chemins de fer de l'Etat néerlandais et Compagnie du chemin de fer hollandais*) (3 679 k.) :

◆ Dr. H. **Van Manen,** membre de la direction;

◆ T. M. F. C. **Jorissen,** chef du service de l'exploitation;

◆ H. P. **Maas-Geesteranus,** chef du service des voies et travaux;

◆ J. J. W. **Van Loenen Martinet*,** ingénieur pour la construction des lignes électriques (rapporteur);

Ch. H. J. **Driessen,** ingénieur de la section des voies et travaux;

◆ G. J. **de Vos van Nederveen Cappel,** ingénieur
signaux;

◆ C. **Leemans*,** ingénieur au service des voies et trava
(rapporteur);

◆ W. **Simon-Thomas,** chef de division au service de l'
ploitation;

◆ Le baron C. R. T. **Krayenhoff,** chef de division.

### II. — Light railways.

*Breskens-Maldegem* (*Tramways à vapeur de*) (42 k

*Sud-néerlandais* (*Tramways à vapeur*) (100 k.) :

J. **Carlier,** vice-président du conseil d'administrati

### B. — COLONIES.

*Etat aux Indes néerlandaises* (*Chemins de fer de*
(3 660 k.) :

◆ M. **Middelberg,** chef du service de la surveillance.

*Indes néerlandaises* (*Compagnie des chemins de fer de*
(749 k.) :

◆ Dr. J. **Kraus,** sénateur, président du conseil d'adr
nistration;

◆ W. H. **Van Schouwenburg,** ingénieur en chef;

◆ W. A. **Slinkers,** ingénieur en chef des voies et travau

*Semarang-Cheribon* (*Société des tramways à vapeu*
(390 k.).

## Peru.

*Lima Railways* (32 k. [20 miles]) :

◆ A. H. **Bartlett,** director.

## Portugal.

### A. — CONTINENT.

### I. — Lines of the State.

*Etat* (*Chemins de fer de l'*) (1 329 k.) :

◆ A. J. **de Proença Vieira,** ingénieur, vogal (assesseu
du conseil supérieur des travaux publics;

◆ C. M. F. **Torres,** ingénieur en chef de l'exploitation
chemin de fer Sud et Sud-Est;

◆ H. P. P. **Bravo** Junior, chef du service du matériel
de la traction du chemin de fer de Minho e Douro;

◆ R. da Costa **Couvreur,** ingénieur au ministère du co
merce et des communications.

### II. — Private lines.

*Beira Alta* (*Compagnie des chemins de fer portug*
*de la*) (253 k.) :

**Delange,** administrateur-délégué;

◆ **Drouin,** inspecteur général.

*Compagnie des chemins de fer portugais* (1 073 k.) :

A. de **Vasconcellos Correia,** administrateur;

J. de **Fontes Ferreira de Mesquita,** directeur général;

A. de **Lima Henriques,** ingénieur en chef de l'exploitation;

M. **Greenfield de Mello,** ingénieur en chef de la voie des travaux;

P. **Joyce Diniz,** ingénieur en chef du matériel et de traction.

*Compagnie nationale des chemins de fer portugais*

85 k.) :

M. **Bello,** ingénieur, président de la direction;

C. de **Souza Bastos,** ingénieur conseil.

### *B.* — COLONIES.

*Etat (Chemins de fer de l')* (1 049 k.) :

M. **Correia de Mello,** ingénieur, directeur général du inistère des travaux;

J. B. **Cerveira e Sousa d'Albuquerque e Castro,** ingé- eur, directeur général du service central du ministère s colonies;

E. J. **Navarro,** ingénieur, chef du service des travaux blics, ports et chemins de fer à la direction générale.

J. E. **dos Santos e Silva,** ingénieur, sous-chef de répar- ion des travaux publics, ports et chemins de fer au inistère des colonies;

## Rumania.

*Etat roumain (Chemins de fer de l')* (10 258 k.) :

S. **Pretorian,** sous-directeur général;

**Panaïtopol,** ingénieur en chef, sous-directeur spécial la traction;

E. **Nitesco,** ingénieur en chef, directeur spécial du ouvement;

C. **Mereutza,** ingénieur en chef, directeur spécial du rvice commercial.

## Salvador.

*Salvador Railway* (161 k. [100 miles]).

## ingdom of Servians, Croatians and Slovenish.

*Chemins de fer de l'Etat* (1 591 k.)

## Sweden.

### I. — Lines of the State.

*Etat suédois (Chemins de fer de l')* (5 582 k.) :

J. A. **Flodin*,** directeur en chef (délégué du gouverne- ent suédois);

P. **Sundberg,** ingénieur en chef;

C. A. **Schultz,** chef de district;

F. O. **Ekman,** chef de district;

◆ H. **Aberg,** directeur;

N. **Ahlberg,** directeur;

◆ G. **Englund,** directeur;

◆ D. O. S. **Silfverstolpe,** directeur de la traction;

◆ I. **Öfverholm*,** directeur (rapporteur);

◆ K. **Ahlberg*,** premier ingénieur (rapporteur).

### II. — Private lines.

*Bergslagen (Chemin de fer)* (552 k.) :

◆ A. **Norrby,** chef de l'exploitation;

◆ H. **Bernhardt,** ingénieur en chef;

V. **Ahlberg,** ingénieur en chef de la traction.

*Blekinge kustbanor* (168 k.) :

◆ Le comte A. **Wachtmeister,** gouverneur de la province de Blekinge, président de la société;

◆ S. **Holmgren,** chef d'administration.

*Frövi-Ludvika (Chemin de fer de)* (98 k.) :

◆ K. L. **Anderson,** superintendent of maintenance of way.

*Gefle-Dala (Société du chemin de fer)* (293 k.) :

◆ A. **Hjelmér,** chef du mouvement;

◆ F. **Nordström,** ingénieur en chef de la traction.

*Halmstad-Nässjö (Chemin de fer)* (411 k.) :

◆ A. **Wiman,** directeur;

◆ V. **Lindström,** chef de l'exploitation.

*Helsingborg-Hessleholm (Chemin de fer)* (122 k.) :

◆ Le baron A. **Thott,** chef.

*Kalmar-Nya (Chemin de fer de)* (195 k.) :

◆ V. **Stahle,** chef des chemins de fer de Kalmar.

*Karlstad-Munkfors, Nordmarks-Klarelfvens, Filipstads Norra-Bergslagen (Chemins de fer)* (171 k.) :

K. A. **Pallin,** ingénieur en chef;

S. A. **Bergelmer,** directeur de l'exploitation.

*Mellersta Oestergötland (Chemin de fer)* (125 k.) :

◆ Le bourgmestre C. H. **Ramsay,** président de la direction;

◆ P. **Kock,** chef de l'exploitation.

*Nässjö-Oskarshamn (Chemin de fer de)* (148 k.) :

Y. **Hjortzberg,** ingénieur en chef.

*Norra-Bergslagen (Chemin de fer)* (173 k.) :

◆ E. **Hildebrand,** directeur;

F. **Wickström,** chef de l'exploitation.

*Norra Oestergötland (Société du chemin de fer de)* (134 k.) :

◆ Le baron G. **Djurklou,** administrateur;

◆ E. M. **Lindgren,** directeur de l'exploitation.

*Norrköping-Söderköping-Vikbolandets (Chemin de fer de)* (102 k.) :

◆ B. **Walentin**, directeur en chef de l'exploitation;
◆ C. **Carlsson**, chef de l'exploitation.

*Norsholm-Westervick-Hultsfred (Chemin de fer de)* (245 k.) :

◆ A. **Rune**, maire et député au Riksdag, président;
◆ J. **Mattsson**, chef de l'exploitation.

*Stockholm-Roslag (Chemin de fer)* (200 k.) :

◆ O. **Nerell**, directeur en chef;
◆ I. **Hallberg**, directeur-adjoint.

*Stockholm - Vesteras - Bergslagen (Chemin de fer)* (479 k.) :

◆ A. **Kamph**, administrateur-délégué;
◆ I. **Hallberg***, membre du conseil d'administration (délégué du chemin de fer Stockholm-Roslag);
◆ H. **Swartling**, directeur.

*Uddevalla-Venersborg-Herrljunga (Chemin de fer de)* (92 k.) :

◆ R. **Wester**, chef du trafic.

*Västergötland-Göteborg (Chemin de fer)* (365 k.) :

◆ J. **Nyström**, directeur-gérant;
◆ O. **Bärnheim**, représentant de la compagnie à Stockholm.

## Switzerland.

### I. — Standard gauge-track railways.

*Fédéraux (Chemins de fer)* (2 906 k.) :

◆ **Dinkelmann***, président de la direction générale (membre de la Commission permanente);
◆ **Schrafl***, directeur général (rapporteur et délégué du gouvernement suisse);
◆ **Huber***, ingénieur en chef du service de l'électrification (rapporteur);
◆ **Gorjat**, directeur du Ier arrondissement;
◆ **Christen**, directeur, président du IIe arrondissement;
◆ **Mezger**, directeur du IIIe arrondissement;
◆ Dr. **Seiler**, membre de la direction du IVe arrondissement;
◆ **Weiss**, ingénieur en chef de la traction à la direction générale.

*Alpes bernoises (Berne-Lötschberg-Simplon) (Compagnie du chemin de fer des* (253 k.) :

Dr. F. **Volmar**, conseiller d'Etat, membre de la direction;
◆ G. **Kunz**, directeur.

### II. — Narrow gauge-track railways.

*Birsig (Chemin de fer de la vallée de)* (17 k.) :

◆ W. **Leder**, ingénieur, directeur.

*Rhétique (Chemin de fer)* (276 k.) :

◆ G. **Bener**, direktor;
◆ A. **Wohler**, Abteilungsvorstand des Kommerziellen Rechnungsdienstes.

*Viège à Zermatt (Chemin de fer de)* (35 k.) :

◆ A. **Marguerat**, ingénieur, directeur.

*Yverdon-Sainte-Croix (Compagnie du chemin de*
(25 k.) :

◆ E. **Jeanneret**, directeur.

### III. — Rack and cable railway.

*Lausanne à Ouchy (Chemin de fer de)* (2 k.) :

◆ J. J. **Mercier-Dufour**, président du Comité de d
tion.

## Czecho-Slovakia.

### I. — Lines of the State.

*Chemins de fer de l'Etat* (12 402 k.) :

◆ C. **Juranek***, ingénieur, directeur du département au ministère des chemins de fer (délégué du gouve
ment tchéco-slovaque);
◆ H. **Deyl**, ingénieur, conseiller supérieur du bâtim
◆ A. **Fiala**, ingénieur, conseiller des constructions;
◆ E. **Kejr**, ingénieur, conseiller des constructions dé
partement V/4 au ministère des chemins de fer.

### II. — Private line.

*Aussig-Teplitzer Eisenbahn-Gesellschaft* (346 k.)

M. **Feilchenfeld**, Präsident des Verwaltungsrates;
F. **Kleinwächter**, Ingenieur, Generaldirektor;
K. **Stradal**, administrativer Direktor und Genera
rektor-Stellvertreter.

## Uruguay.

*Central Uruguay Railway of Montevideo* (1 57
[980 miles]) :

◆ F. **Henderson**, chairman;
H. J. **Bell**, director;
◆ W. **Higgins**, director;
◆ Hon. P. **Henderson**, consulting engineer;
◆ G. R. **Cable**, secretary;
◆ T. B. **Davies**, storekeeper.

*North Western of Uruguay Railway* (182 k.
miles]) :

◆ G. W. **Teague**, general manager;
◆ R. F. **Fisher**, secretary.

# ALPHABETICAL INDEX OF DELEGATES PRESENT AT THE SESSION

## INDICATING THE SECTIONS THEY ATTENDED.

| Number. | NAME. | DELEGATED BY | SECTIONS. |
|---|---|---|---|
| 1 | **Aberg** (Hj.) | Chemins de fer de l'Etat (Suède) | 1 |
| 2 | **Acres** (A. W.) | South Indian Railway | 3, 4 & 5 |
| 3 | **Agerskov** (F. S.) | Chemin de fer de Lolland-Falster (Danemark) | 1 & 4 |
| 4 | **Ahlberg** (K.) | Chemins de fer de l'Etat (Suède) | 1 |
| 5 | **Alessandri** (A.) | Commission permanente de l'Association (Section italienne) et Chemins de fer de l'Etat italien | 1, 2 & 4 |
| 6 | **Allemand** (F.) | Commission permanente de l'Association (Section italienne) | 3, 4 & 5 |
| 7 | **Allen** (A. W.) | Midland Railway (Grande-Bretagne) | 2, 3 & 4 |
| 8 | **Alstrup** (A.) | Commission permanente de l'Association, ministère des travaux publics et Chemins de fer de l'Etat danois | 4 |
| 9 | **Andersen** (N. I. U.) | Chemins de fer de l'Etat danois | 3 & 4 |
| 10 | **Anderson** (K. L.) | Chemin de fer de Frövi-Ludvika (Suède) | 1 & 3 |
| 11 | **Andreae** (C.) | Département fédéral des postes et des chemins de fer (Suisse) | 1 & 3 |
| 12 | **Andriveau** (F. A.) | Tramways de l'Indre (France) | 5 |
| 13 | **Anstruther** (H. T.) | Railway Clearing House (Grande-Bretagne) | 4 |
| 14 | **Anthony** (P. A.) | Federated Malay States Railways | 3 & 5 |
| 15 | **Armanni** (A.) | Société anonyme pour les chemins de fer vicinaux (Italie) | 1 & 4 |
| 16 | **Arnould** | Chemin de fer du Nord (France) | 2, 3 & 4 |
| 17 | **Aronovici** (A.) | Great Eastern Railway (Grande-Bretagne) | 1, 3 & 4 |
| 18 | **Arrillaga** (M. M.) | Chemins de fer de Madrid à Saragosse et à Alicante (Espagne) | 3 & 5 |
| 19 | **Atterbury** (W. W.) | Commission permanente de l'Association, Secrétariat d'Etat, American Railway Association et Pennsylvania System | 3 |
| 20 | **Aubert** | Chemins de fer de l'Etat (Norvège) | 1, 3, 4 & 5 |
| 21 | **Aubry** (L.) | Chemins de fer Départementaux du Tarn (France) | 3, 4 & 5 |
| 22 | **Bachellery** | Chemins de fer du Midi (France) | 2 |
| 23 | **Baillie** (J. E. B.) | Highland Railway (Grande-Bretagne) | 1 & 2 |
| 24 | **Baldwin** (A. S.) | Illinois Central Railroad (Etats-Unis d'Amérique) | 3 |
| 25 | **Ball** (J. R.) | London & North Western Railway (Grande-Bretagne) | 1, 4 & 5 |
| 26 | **Ballesteros** | Chemins de fer du Nord de l'Espagne | 1 & 3 |
| 27 | **Balling** | Chemin de fer d'Orléans (France) | 1, 2 & 3 |
| 28 | **Bancroft** (W. N.) | Midland Railway (Grande-Bretagne) | 2, 3 & 4 |
| 29 | **Baptista** (J. L.) | Ministère de l'industrie des communications et de travaux publics (Brésil) | 3 & 4 |
| 30 | **Barber** (A. B.) | Ministère des chemins de fer (Pologne) | 1 & 2 |

| Number. | NAME. | DELEGATED BY | SECTIONS. |
|---|---|---|---|
| 31 | **Barbieri** (G.) | Chemins de fer de l'Etat italien | 1 |
| 32 | **Barnet Lyon** (L. M.) | Ministère du Waterstaat (Pays-Bas) | 1 & 2 |
| 33 | **Bärnheim** (O.) | Chemin de fer Västergötland-Göteborg (Suède) | 3 |
| 34 | **Barnwell** (F. A.) | North Staffordshire Railway (Grande-Bretagne) | 3 & 4 |
| 35 | **Barocio** (A.) | Ministère des travaux publics (Mexique) | 1, 4 & 5 |
| 36 | **Barrand** | Ministère des travaux publics (France). | 1 |
| 37 | **Barrie** (C. B.) | North Western Railway (State Railway of India) | 1, 4 & 5 |
| 38 | **Bartlett** (A. H.) | Lima Railways (Pérou) | 4 |
| 39 | **Baselga y Ramirez** (M.) | Chemins de fer et mines de Utrillas (Espagne) | 5 |
| 40 | **Baselga y Ramirez** (S.) | Chemins de fer et mines de Utrillas (Espagne) | 5 |
| 41 | **Bastos** (S. C.) | Compagnie nationale des chemins de fer portugais | 3 |
| 42 | **Bauër** | Chemins de fer de l'Etat français | 1 |
| 43 | **Beamonte** (B.) | Chemins de fer de Madrid à Saragosse et à Alicante (Espagne) | 1 & 4 |
| 44 | **Beaugey** (R.) | Chemin de fer de Rosario à Puerto Belgrano (République Argentine) | 3, 4 & 5 |
| 45 | **Beck** | Chemins de fer de l'Est brésilien | 5 |
| 46 | **Beckwith** (A.) | Neath & Brecon Railway (Grande-Bretagne) | 2 |
| 47 | **Beghin** (M.) | Chemins de fer Départementaux (France) | 3 & 5 |
| 48 | **Behrens** (G.) | Commission permanente de l'Association et Midland Railway (Grande-Bretagne) | 3 |
| 49 | **Bello** (M.) | Compagnie nationale des chemins de fer portugais | 1, 3 & 5 |
| 50 | **Bénac** | Chemin de fer d'Orléans (France) | 4 |
| 51 | **Bener** (G.) | Chemin de fer Rhétique (Suisse) | 1 & 4 |
| 52 | **Bernard** (A.) | Chemin de fer de Ceinture de Paris | 3 |
| 53 | **Bernhardt** (H.) | Chemin de fer Bergslagen (Suède) | 1 & 4 |
| 54 | **Berthelier** (F.) | Société générale des chemins de fer économiques (France) | 5 |
| 55 | **Beyaert** (P.) | Railways économiques de Liége-Seraing et extensions (Belgique) | 5 |
| 56 | **Biard** | Chemins de fer de l'Est (France) | 2 |
| 57 | **Bidaut** | Chemins de fer algériens de l'Etat | 1 |
| 58 | **Biraghi** (P.) | Commission permanente de l'Association (rapporteur) | 3, 4 & 5 |
| 59 | **Blaise** (C.) | Chemins de fer de l'Etat (Chine) | 3, 4 & 5 |
| 60 | **Boag** (G. L.) | Great Southern of Spain Railway (Espagne) | 3 & 4 |
| 61 | **Boalth** (V. H.) | North Western Railway (State Railway of India) | 3, 4 & 5 |
| 62 | **Bochet** | Ministère des travaux publics (France) | 2, 3 & 4 |
| 63 | **Bonnevay** (E.) | Chemins de fer de l'Etat chinois | 1 & 2 |
| 64 | **Bonnevay** (M. C.) | Chemins de fer algériens de la Compagnie de Paris à Lyon et à la Méditerranée | 3 |
| 65 | **Bonnevie** | Commission permanente de l'Association (rapporteur) | 1 & 5 |
| 66 | **Booth** (C.) | Midland Railway (Grande-Bretagne) | 3 |
| 67 | **Boulière** (E.) | Chemin de fer de l'Etat hellénique | 2 |

| Number. | NAME. | DELEGATED BY | SECTIONS. |
|---|---|---|---|
| 68 | **Boulongne** (L. de) | Chemins de fer de Paris à Lyon et à la Méditerranée (France) | 1 |
| 69 | **Bourlon de Sarty** (P.) | Chemin de fer de Smyrne-Cassaba et prolongements (Asie Mineure) | 2 |
| 70 | **Bourne** (G. L.) | New York Central Railroad (Etats-Unis d'Amérique) | 2 & 4 |
| 71 | **Bouteau** (M.) | Chemins de fer économiques du Nord (France) | 5 |
| 72 | **Bouthillier-Chavigny** (Le comte J. de). | Chemin de fer de Damas-Hamah et prolongements (Asie Mineure) | 2 & 4 |
| 73 | **Boutteville** | Chemin de fer de la Réunion (Ile de la Réunion) | 2, 4 & 5 |
| 74 | **Bouyoukas** (G. P.) | Ministère des communications (Grèce) | 3 & 4 |
| 75 | **Braem** (A.) | Ministère des chemins de fer, marine, postes et télégraphes et Chemins de fer de l'Etat belge | 4 |
| 76 | **Brant** (F. A.) | South Eastern & Chatham Railway (Grande-Bretagne) | 3 & 4 |
| 77 | **Bravo junior** (H. P. P.) | Chemins de fer de l'Etat portugais | 2, 3 & 4 |
| 78 | **Bréville** | Chemin de fer du Nord (France) | 2, 3 & 4 |
| 79 | **Brickwell** (A. J.). | Great Northern Railway (Grande-Bretagne) | 1 & 4 |
| 80 | **Briggs** (J.) | Midland Railway (Grande-Bretagne) | 1 & 2 |
| 81 | **Brisse** | Chemins de fer de l'Est (France) | 2, 3 & 4 |
| 82 | **Brooke** (J. R.) | Ministère des transports (Grande-Bretagne) | 4 |
| 83 | **Brown** (C. J.) | Great Northern Railway (Grande-Bretagne) | 1, 2 & 5 |
| 84 | **Bruneel** | Commission permanente de l'Association, Ministère des chemins de fer, marine, postes et télégraphes et Chemins de fer de l'Etat belge | 1 |
| 85 | **Budden** (F. H.) | North Western Railway (State Railway of India) | 3 & 4 |
| 86 | **Bülow** (P. M.) | Chemins de fer de l'Etat danois. | 1 & 3 |
| 87 | **Burt** (Sir Henry P.) | Bengal & North Western Railway (Indes anglaises) | 1, 3, 4 & 5 |
| 88 | **Cable** (G. R.) | Central Uruguay Railway of Montevideo | 3 & 4 |
| 89 | **Cambournac** | Chemin de fer du Nord (France) | 1 & 4 |
| 90 | **Campion** (F. A.) | Great Northern Railway (Ireland) | 1 & 5 |
| 91 | **Canova** (G.) | Ministère des voies de communication (Siam) | 1, 3 & 5 |
| 92 | **Carlsson** (C.) | Chemin de fer Norrköping-Söderköping-Vikbolandets (Suède) | 3 |
| 93 | **Casinelli** (L.) | Commission permanente de l'Association (Section italienne) | 1, 2 & 4 |
| 94 | **Cattaneo** (U.) | Commission permanente de l'Association (section italienne) et Chemins de fer de l'Etat italien | 1, 2 & 4 |
| 95 | **Caufriez** (H.) | Société nationale des chemins de fer vicinaux (Belgique) | 4 & 5 |
| 96 | **Causey** (W. B.) | American Railway Association | 1 & 3 |
| 97 | **Caviedes** (Le marquis de) | Chemins de fer du Nord de l'Espagne | 4 & 5 |
| 98 | **Cayphas** (A.) | Compagnie belge des chemins de fer et d'entreprises | 2 & 4 |

| Number. | NAME. | DELEGATED BY | SECTIONS. |
|---|---|---|---|
| 99 | **Cecil** (The Right Hon. Sir Evelyn) | Commission permanente de l'Association et London & South Western Railway (Grande-Bretagne) | 3 & 4 |
| 100 | **Charnley** (J. E.) | Cheshire Lines Committee (Grande-Bretagne) | 3, 4 & 5 |
| 101 | **Charron** | Chemins de fer du Midi (France) | 2, 3 & 4 |
| 102 | **Chaumet** (J.) | Chemins de fer de Grande-Banlieue (France) | 3 & 4 |
| 103 | **Chavegrin** | Commission permanente de l'Association (secrétaire de section) | 4 |
| 104 | **Chenut** (L.) | Chemin de fer de Smyrne-Cassaba et prolongement (Asie Mineure) | 3, 4 & 5 |
| 105 | **Chevalier** (H.) | Chemins de fer du Cambrésis (France) | 2, 3 & 5 |
| 106 | **Christen** | Chemins de fer fédéraux (Suisse) | 1 |
| 107 | **Christie** (L. R.) | Great Central Railway (Grande-Bretagne) | 2, 3 & 4 |
| 108 | **Ciappi** (A.) | Ministère des travaux publics (Italie) | 2 |
| 109 | **Cito** (N.) | Chemin de fer du Bas-Congo au Katanga | 1, 2 & 3 |
| 110 | **Clarke** (C. B. O.) | Cambrian Railways (Grande-Bretagne) | 3 |
| 111 | **Clarke** (J. P.) | Buenos Ayres Great Southern Railway (République Argentine) | 1, 3 & 4 |
| 112 | **Clow** (W.) | Great Central Railway (Grande-Bretagne) | 3 |
| 113 | **Colding** (P. A. H.) | Ministère des travaux publics (Danemark) | 3, 4 & 5 |
| 114 | **Cole** (F. E.) | North Western Railway (State Railway of India) | 1, 3 & 4 |
| 115 | **Colens** (J.) | Ministère des chemins de fer, marine, postes et télégraphes (Belgique) | 2, 4 & 5 |
| 116 | **Collett** (C. B.) | Great Western Railway (Grande-Bretagne) | 2 |
| 117 | **Collins** (F. R.) | South African Railways & Harbours | 2, 3 & 5 |
| 118 | **Colson** | Commission permanente de l'Association et Ministère des travaux publics (France) | 3 & 4 |
| 119 | **Comble** (J.) | Chemin de fer de Rosario à Puerto Belgrano (République Argentine) | 5 |
| 120 | **Constable** (W.) | Madras & Southern Mahratta Railway (Indes anglaises) | 1 & 2 |
| 121 | **Coomber** (W. H.) | Lancashire & Yorkshire Railway (Grande-Bretagne) | 1 & 5 |
| 122 | **Cooper** (A. R.) | City & South London Railway (Grande-Bretagne) | 1, 2 & 3 |
| 123 | **Cooper** (C.) | London, Brighton & South Coast Railway (Grande-Bretagne) | 3 & 4 |
| 124 | **Cooper** (D.) | Glasgow & South Western Railway (Grande-Bretagne) | 2, 3 & 4 |
| 125 | **Coppin** (V.) | Ministère des relations extérieures (République du Paraguay) | 4 |
| 126 | **Cordier** | Chemins de fer de Paris à Lyon et à la Méditerranée (France) | 1, 3 & 4 |
| 127 | **Cornara** (L.) | Tramways Vercellesi (Italie) | 2 & 5 |
| 128 | **Cornè** (R. de) | Commission permanente de l'Association | 1 & 3 |
| 129 | **Corteil** | Commission permanente de l'Association, Ministère des chemins de fer, marine, postes et télégraphes et Chemins de fer de l'Etat belge | 2 |

| Number. | NAME. | DELEGATED BY | SECTIONS. |
|---|---|---|---|
| 130 | Courau | Chemins de fer de l'Est brésilien | 3 & 4 |
| 131 | Couvreur (R. da Costa) | Chemins de fer de l'Etat portugais | 1 & 5 |
| 132 | Couvreux | Chemins de fer du Midi (France) | 1 & 4 |
| 133 | Crawford (D. F.) | Secrétariat d'Etat (Etats-Unis d'Amérique) | 2 & 3 |
| 134 | Crimail (L. F.) | Ministère des communications (Chine) | 3 & 4 |
| 135 | Crombé (G.) | Société générale de chemins de fer économiques (Belgique) | 2 & 5 |
| 136 | Crova (C.) | Commission permanente de l'Association et chemins de fer de l'Etat italien | 1, 3 & 4 |
| 137 | Cuningham (C. A.) | Colonie de Nigeria et Nigerian Railway (Afrique de l'Ouest) | 4 |
| 138 | Damm (L. A.) | Chemin de fer de Lolland-Falster (Danemark) | 4 |
| 139 | Dantas (A. J.) | Ministère du commerce et des communications (Portugal) | 4 |
| 140 | Davidson (G.) | Great North of Scotland Railway | 3 & 4 |
| 141 | Davies (A.) | Lancashire & Yorkshire Railway (Grande-Bretagne) | 2, 3 & 4 |
| 142 | Davies (T. B.) | Central Uruguay Railway of Montevideo | 3 & 4 |
| 143 | Dawson (Sir Philip) | London Brighton & South Coast Railway (Grande-Bretagne) | 2 |
| 144 | Debarsy (H.) | Société nationale des chemins de fer vicinaux (Belgique) | 3 |
| 145 | Dejean | Chemins de fer de l'Etat français | 3, 4 & 5 |
| 146 | Delaluque (G.) | Chemins de fer de l'Etat hellénique | 3 & 4 |
| 147 | Delu (A.) | Chemins de fer du Nord de l'Espagne | 1 & 2 |
| 148 | Dent (C. H.) | Great Northern Railway (Grande-Bretagne) | 1, 2 & 3 |
| 149 | Denti (E.) | Fédération des transports (Italie) | 1, 2 & 5 |
| 150 | De Ponteves (de Ruffi) | Ministère des travaux publics (France). | 2, 3 & 4 |
| 151 | Depoorter | Commission permanente de l'Association (secrétaire de section) | 1 |
| 152 | De Rechter | Commission permanente de l'Association, Ministère des chemins de fer, marine, postes et télégraphes et Chemins de fer de l'Etat belge | 2 |
| 153 | Desprets (R.) | Commission permanente de l'Association. | 1 & 3 |
| 154 | Desroys du Roure | Compagnie française des chemins de fer de la province de Santa-Fé (République Argentine) | 4 |
| 155 | Detoeuf | Ministère des travaux publics (France). | 3 & 4 |
| 156 | Detraux | Chemins de fer Andalous (Espagne) | 3 |
| 157 | Deuchars (G.) | Secrétariat d'Etat pour l'Empire des Indes | 1 & 2 |
| 158 | Deyl (H.) | Chemins de fer de l'Etat (Tchéco-Slovaquie) | 1 & 4 |
| 159 | Dice (A. T.) | Philadelphia & Reading Railway (Etats-Unis d'Amérique) | 4 |
| 160 | Dinkelmann | Commission permanente et Chemins de fer fédéraux suisses | 3 & 4 |
| 161 | Direz | Chemins de fer de l'Etat français | 2, 3 & 4 |
| 162 | Djurklou (Baron G.) | Société du chemin de fer de Norra-Oestergötland (Suède) | 3 |

| Number. | NAME. | DELEGATED BY | SECTIONS. |
|---|---|---|---|
| 163 | **Donati** (A.) | Commission permanente de l'Association (section italienne) et Chemins de fer de l'Etat italien | 1, 2 & 3 |
| 164 | **Downs** (L. A.) | American Railway Association et Central of Georgia Railway | 1 & 3 |
| 165 | **Dreyfuss** | Chemins de fer de l'Etat français | 1, 4 & 5 |
| 166 | **Drouin** | Chemins de fer portugais de la Beira Alta | 2, 3 & 4 |
| 167 | **Drummond** (H. W.) | London & South Western Railway (Grande-Bretagne) | 2 & 4 |
| 168 | **Dubois** | Chemins de fer de l'Etat français | 2, 3 & 4 |
| 169 | **Du Castel** | Ministère des travaux publics (France). | 2, 3 & 4 |
| 170 | **Duchatel** | Chemins de fer de l'Est (France) | 2 & 3. |
| 171 | **Duer** (J. V. B.) | Pennsylvania System (Etats-Unis d'Amérique) | 2 |
| 172 | **Duffus** (A.) | Great North of Scotland Railway | 3 & 4 |
| 173 | **Dunn** (S. O.) | Commission permanente de l'Association (rapporteur) | 1, 2, 3, 4 & 5 |
| 174 | **Dunott** (Dr D. Z.) | American Railway Association | 3 & 4 |
| 175 | **Duplaix** | Chemins de fer de l'Etat français | 1 & 4 |
| 176 | **Dutreux** (A.) | Chemins de fer Guillaume-Luxembourg. | 2 |
| 177 | **Ehrenfreund** (E.) | Chemins de fer de l'Etat italien | 1, 4 & 5 |
| 178 | **Eichthal** (E. d') | Chemins de fer du Midi (France) | 4 |
| 179 | **Eichthal** (W. d') | Compagnie des Phosphates et du Chemin de fer de Gafsa (Tunisie) | 4 & 5 |
| 180 | **Eir** (G. C.) | Chemins de fer de l'Etat danois | 3 |
| 181 | **Ekman** (B. O.) | Chemins de fer de l'Etat (Suède) | 2 & 3 |
| 182 | **Elgin** (The Earl of) | North British Railway (Grande-Bretagne) | 1 & 2 |
| 183 | **Eliot** (E. G.) | Railway Clearing House (Grande-Bretagne) | 4 |
| 184 | **Ellson** (G.) | South Eastern & Chatham Railway (Grande-Bretagne) | 1, 2 & 4 |
| 185 | **Engel** (F.) | London & North Western Railway (Grande-Bretagne) | 4 |
| 186 | **Englund** (G.) | Chemins de fer de l'Etat (Suède) | 3 & 4 |
| 187 | **Epinay** | Chemin de fer d'Orléans (France) | 3 & 4 |
| 188 | **Ertzbischoff** | Chemins de fer d'Alsace et de Lorraine. | 3 & 4 |
| 189 | **Esmonde** (Sir Thomas H.G.) | Dublin & South Eastern Railway (Ireland) | 4 |
| 190 | **Evans** (T.) | Barry Railway (Grande-Bretagne) | 3 |
| 191 | **Fairbanks** (J. E.) | American Railway Association | 1, 2, 3, 4 & 5 |
| 192 | **Falck** (F. M.) | Philadelphia & Reading Railway (Etats-Unis d'Amérique) | 1 & 2 |
| 193 | **Fattori** (G.) | Société vénitienne pour la construction et l'exploitation des chemins de fer secondaires en Italie | 3 |
| 194 | **Favière** | Direction générale des travaux publics (Tunisie) | 1, 2 & 3 |
| 195 | **Fay** (Sir Sam) | Great Central Railway (Grande-Bretagne) | 2, 3 & 4 |
| 196 | **Felling** (C. L. N.) | South African Railways & Harbours | 3, 4 & 5 |
| 197 | **Felsenhart** (E.) | Chemin de fer du Bas-Congo au Katanga. | 1 |
| 198 | **Ferrand** (C.) | Chemins de fer de Bône-Guelma et prolongements (Algérie) | 2 |

| Number | NAME. | DELEGATED BY | SECTIONS. |
|---|---|---|---|
| 199 | **Fiala (A.)** | Chemins de fer de l'Etat (Tchéco-Slovaquie) | 3, 4 & 5 |
| 200 | **Fiedler (A.)** | Compagnie belge des chemins de fer et d'entreprises | 2 & 4 |
| 201 | **Finnis (D. R.)** | Taltal Railway (Chili) | 2 & 4 |
| 202 | **Fiori (F.)** | Chemins de fer de l'Etat italien | 3 |
| 203 | **Firth (H. W.)** | Great Eastern Railway (Grande-Bretagne) | 2, 3 & 5 |
| 204 | **Fisher (J. H.)** | Hull & Barnsley Railway (Grande-Bretagne) | 1, 2 & 3 |
| 205 | **Fisher (R. F.)** | North Western of Uruguay Railway | 3 & 4 |
| 206 | **Fison (Sir Frederick)** | Great Northern & Great Eastern Joint Committee (Grande-Bretagne) | 1 & 2 |
| 207 | **Flensborg (H.)** | Chemins de fer de l'Etat danois | 1, 3 & 4 |
| 208 | **Fletcher (A.)** | Delaware, Lackawanna & Western Railroad (Etats-Unis d'Amérique) | 2 |
| 209 | **Flodin (J. A.)** | Chemins de fer de l'Etat (Suède) | 3 & 4 |
| 210 | **Floor (A.)** | Chemins de fer de l'Etat danois | 2 |
| 211 | **Follows (J. H.)** | Midland Railway (Grande-Bretagne) | 2, 3 & 4 |
| 212 | **Fontaneilles** | Commission permanente de l'Association et Ministère des travaux publics (France) | 1, 2 & 5 |
| 213 | **Fontes Ferreira de Mesquita (J. de).** | Compagnie des chemins de fer portugais. | 1, 2 & 3 |
| 214 | **Forbes (G. C.).** | Federated Malay States Railways | 2 |
| 215 | **Forbes (H.)** | County Donegal Railways Joint Committee (Grande-Bretagne) | 3 & 5 |
| 216 | **Forbes (Sir William)** | London Brighton & South Coast Railway (Grande-Bretagne) | 2 & 3 |
| 217 | **Forges Davanzati (A.)** | Fédération des transports (Italie) | 2, 4 & 5 |
| 218 | **Fowler (Sir Henry)** | Midland Railway (Grande-Bretagne) | 2, 3 & 4 |
| 219 | **Frank (A.)** | Ministère des chemins de fer (Pologne) | 1, 2 & 3 |
| 220 | **Franza (E.)** | Commission permanente de l'Association (section italienne) et Chemins de fer de l'Etat italien | 4 |
| 221 | **Fraser (W. S.)** | Bombay, Baroda & Central India Railway | 1, 2 & 3 |
| 222 | **Fraud (L.)** | Compagnie générale de voies ferrées d'intérêt local (France) | 5 |
| 223 | **Fukumi (S.)** | South Manchuria Railway (Chine) | 2, 3 & 5 |
| 224 | **Fuster (J. M.)** | Ministère du fomento (Espagne) | 1, 2 & 4 |
| 225 | **Fuzine (J.)** | South Manchuria Railway (Chine) | 1 & 5 |
| 226 | **Gabbia (E.)** | Commission permanente de l'Association (secrétaire de section) | 1, 2 & 3 |
| 227 | **Gales (Sir Robert R.)** | Secrétariat d'Etat pour l'Empire des Indes | 1 |
| 228 | **Gandini (G.)** | Société pour le chemin de fer complémentaire de la Sardaigne (Italie) | 5 |
| 229 | **Gari Cañas (J.)** | Chemins de fer de Medina del Campo à Zamora et Orense à Vigo (Espagne) | 3 & 4 |
| 230 | **Gaviraghi (C.)** | Commission permanente de l'Association (rapporteur) | 2 & 5 |
| 231 | **Geerts (G.)** | Compagnie du Chemin de fer du Congo. | 1, 2 & 3 |
| 232 | **Genard (H.)** | Société nationale des chemins de fer vicinaux (Belgique) | 5 |
| 233 | **Genovesi (F.)** | Ministère des travaux publics (Italie) | 2, 4 & 5 |
| 234 | **George (W. J.)** | Entre Rios Railways (République Argentine) | 4 |

| Numker. | NAME. | DELEGATED BY | SECTIONS. |
|---|---|---|---|
| 235 | **Gerard** (E.) . . . . . . . | Commission permanente de l'Association et Société nationale des chemins de fer vicinaux (Belgique) . . . . . . | 2 & 5 |
| 236 | **Gérardin** . . . . . . . . | Chemins de fer de l'Est (France) . . . | 3 & 4 |
| 237 | **Ghisi** . . . . . . . . . . | Chemin de fer Circumetnea (Société sicilienne de travaux publics) (Italie) . | 1, 2 & 5 |
| 238 | **Gibbs** (G.) . . . . . . . . | American Railway Association & Long Island Railroad . . . . . . . . . | 1, 2 & 3 |
| 239 | **Gibson** (A. L.) . . . . . . | Great Eastern Railway (Grande-Bretagne) . . . . . . . . . . . . . | 4 & 5 |
| 240 | **Gieysztor** (J.) . . . . . . . | Ministère des chemins de fer (Pologne). | 3 & 4 |
| 241 | **Gilmore** (H. St. G.) . . . | Eastern Bengal Railway (State Railway of India) . . . . . . . . . . . . | 4 |
| 242 | **Gilroy** (A. B.) . . . . . . . | North British Railway (Grande-Bretagne) . . . . . . . . . . . . . | 3 & 4 |
| 243 | **Gioppo** (R.) . . . . . . . | Commission permanente de l'Association (section italienne) et Chemins de fer de l'Etat italien . . . . . . . . . | 1 |
| 244 | **Giovanola** (P.) . . . . . . | Chemin de fer du Tessin (Italie) . . . | 5 |
| 245 | **Giovene** (N.) . . . . . . . | Commission permanente de l'Association (section italienne) et Chemins de fer de l'Etat italien . . . . . . . . . | 1, 3 & 4 |
| 246 | **Girard** (R.) . . . . . . . | Chemins de fer de l'Etat italien . . . . | 1 |
| 247 | **Girod de l'Ain** . . . . . | Chemins de fer de l'Est (France) . . . | 1 & 4 |
| 248 | **Glover** (G. T.) . . . . . . | Great Northern Railway (Ireland) . . | 2 |
| 249 | **Glyn** (R.) . . . . . . . . | Caledonian Railway (Grande-Bretagne) . | 2 & 5 |
| 250 | **Godard** . . . . . . . . . | Chemins de fer du Midi (France) . . . | 1 & 4 |
| 251 | **Godon** (A.) . . . . . . . | Chemins de fer du Sud-Ouest (France) . | 1 & 5 |
| 252 | **Goffin** (E.) . . . . . . . | Compagnie du chemin de fer du Congo . | 1, 2, 3 & 5 |
| 253 | **Golard** . . . . . . . . . | Ministère des chemins de fer, marine, postes et télégraphes et Chemins de fer de l'Etat belge . . . . . . . . | 1 |
| 254 | **Goldney** (E. P.) . . . . . | Great Indian Peninsula Railway . . . | 2 & 3 |
| 255 | **Gorjat** . . . . . . . . . | Chemins de fer fédéraux (Suisse) . . . | 3 & 4 |
| 256 | **Goyard** . . . . . . . . . | Chemins de fer Départementaux (France) | 1 & 5 |
| 257 | **Grasset** (H.) . . . . . . . | Chemins de fer du Nord de l'Espagne . . | 1, 2 & 3 |
| 258 | **Gratama** (B. M.) . . . . | Ministère du waterstaat (Pays-Bas) . . | 1 |
| 259 | **Gray** (A. R.) . . . . . . . | North British Railway (Grande-Bretagne) . . . . . . . . . . . . . | 3 & 4 |
| 260 | **Green** (A. D.) . . . . . . . | North Western Railway (State Railway of India) . . . . . . . . . . . . | 3, 4 & 5 |
| 261 | **Greenfield de Mello** (M.) . | Compagnie des chemins de fer portugais. | 1 & 4 |
| 262 | **Greenhough** (F. H.) . . . | Nigerian Railway (Afrique de l'Ouest) . | 1 & 5 |
| 263 | **Grellier** . . . . . . . . . | Chemins de fer Départementaux (France) | 2 |
| 264 | **Grené** . . . . . . . . . | Chemins de fer de l'Etat chinois . . . | 1 & 5 |
| 265 | **Gresley** (H. N.) . . . . . | Great Northern Railway (Grande-Bretagne) . . . . . . . . . . . . . | 2, 3 & 4 |
| 266 | **Grierson** (W. W.) . . . . . | Great Western Railway (Grande-Bretagne) . . . . . . . . . . . . . | 1 |
| 267 | **Grillo** (C.) . . . . . . . . | Commission permanente (secrétaire de section) . . . . . . . . . . . . | 4 |
| 268 | **Grillo** (G.) . . . . . . . . | Commission permanente de l'Association et Chemins de fer de l'Etat italien . . | 1 |
| 269 | **Grismayer** (E.) . . . . . | Ministère des travaux publics (Italie) . | 1, 2 & 4 |
| 270 | **Gruson** . . . . . . . . . | Chemins de fer de l'Est français . . . | 3 & 4 |
| 271 | **Guastalla** (E.) . . . . . . | Société émilienne de chemins de fer, tramways et automobiles (Italie) . . | 1, 2 & 4 |

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|---|---|---|---|
| 272 | **Gufflet** | Chemins de fer du Midi (France) | 3 & 4 |
| 273 | **Guillon** (E.) | Société générale de chemins de fer économiques (Belgique) | 2 & 5 |
| 274 | **Guillon** (L.) | Chemins de fer de Saône-et-Loire (France) | 2 & 5 |
| 275 | **Guzman** (P. P.) | Ministère des travaux publics (République de l'Equateur) | 1 & 5 |
| 276 | **Habran** (J.) | Commission permanente de l'Association | 3 & 4 |
| 277 | **Hackenberg** (J. O.) | Pennsylvania System (Etats-Unis d'Amérique) | 3 |
| 278 | **Haffner** | Chemins de fer de l'Etat français | 2 & 5 |
| 279 | **Hagneaux** (A.) | Compagnie générale de voies ferrées d'intérêt local (France) | 3 & 5 |
| 280 | **Hallberg** (I.) | Chemins de fer Stockholm-Roslag et Stockholm-Vesteras-Bergslagen (Suède) | 3, 4 & 5 |
| 281 | **Hanrez** | Commission permanente de l'Association, Ministère des chemins de fer, marine, postes et télégraphes et Chemins de fer de l'Etat belge | 3 & 4 |
| 282 | **Harper** (R. T.) | Buenos-Ayres Great Southern Railway (République Argentine) | 3 & 4 |
| 283 | **Hawkins** (A. V.) | Eastern Bengal Railway (State Railway of India) | 3 & 4 |
| 284 | **Heaven** (F. G.) | Bombay, Baroda & Central India Railway | 3 & 4 |
| 285 | **Hecquet** | Chemin de fer de Somain à Anzin et à la frontière belge (France) | 4 |
| 286 | **Henderson** (F.) | Central Uruguay Railway of Montevideo | 3 & 4 |
| 287 | **Henderson** (Hon. P.) | Central Uruguay Railway of Montevideo | 1, 2 & 5 |
| 288 | **Henry** (A.) | Chemins de fer de l'Est (France) | 1 |
| 289 | **Henry-Gréard** | Chemin de fer d'Orléans (France) | 2, 3 & 4 |
| 290 | **Herbelot** | Compagnie française des chemins de fer de la Province de Santa-Fé (République Argentine) | 1 |
| 291 | **Herbert** (S.) | Stratford-upon-Avon & Midland Junction Railway (Grande-Bretagne) | 3 |
| 292 | **Heremans** (E.) | Commission permanente de l'Association (secrétariat du comité) | 3 & 4 |
| 293 | **d'Hertoghe** (J.) | Compagnie générale de chemins de fer Catalans (Espagne) | 3 & 4 |
| 294 | **Heurteau** | Commission permanente de l'Association et Compagnie du Chemin de fer d'Orléans (France) | 4 |
| 295 | **Heywood** (T. E.) | Great North of Scotland Railway | 2 |
| 296 | **Higgins** (W.) | Central Uruguay Railway of Montevideo | 4 |
| 297 | **Hildebrand** (E.) | Chemin de fer Norra-Bergslagen (Suède) | 1 & 3 |
| 298 | **Hjelmér** (A.) | Société du chemin de fer Gefle-Dala (Suède) | 3 |
| 299 | **Hoff** | Chemins de fer de l'Etat (Norvège) | 2 |
| 300 | **Holemans** (E.) | Commission permanente de l'Association. | 3 & 4 |
| 301 | **Holmgren** (S.) | Blekinge kustbanor (Suède) | 1 |
| 302 | **Holtfodt** (C. T.) | Ministère des travaux publics et Chemins de fer de l'Etat (Norvège) | 4 |
| 303 | **Huber** | Chemins de fer fédéraux (Suisse) | 2 |

| Number. | NAME. | DELEGATED BY | SECTIONS. |
|---|---|---|---|
| 304 | **Hughes** (G.) | Lancashire & Yorkshire Railway (Grande-Bretagne) | 2 |
| 305 | **Hunt** (K. P.) | Londonderry & Lough Swilly Railway (Ireland) | 5 |
| 306 | **Inkson** (N. L.) | Great Indian Peninsula Railway | 2 & 3 |
| 307 | **Inouye** (I.) | Ministère des communications (Japon) | 2 & 5 |
| 308 | **Irvin** (Sir John H.) | Great North of Scotland Railway | 4 |
| 309 | **Irwin** (R. C.) | Lancashire & Yorkshire Railway (Grande-Bretagne) | 2, 3 & 4 |
| 310 | **Jac** | Chemins de fer d'Alsace et de Lorraine. | 4 |
| 311 | **Jacobs** (L.) | Société nationale des chemins de fer vicinaux (Belgique) | 3 & 5 |
| 312 | **Japiot** | Chemins de fer de Paris à Lyon et à la Méditerranée (France) | 2 & 3 |
| 313 | **Javary** (P. E.) | Chemin de fer du Nord (France) | 2, 3 & 4 |
| 314 | **Jeanneret** (E.) | Chemin de fer d'Yverdon-Sainte-Croix (Suisse) | 1, 2 & 5 |
| 315 | **Jepson** (W. A.) | Kent, Somerset & Shropshire Light Railway Group (Grande-Bretagne) | 4 & 5 |
| 316 | **Jones** (C.) | Metropolitan Railway (Grande-Bretagne) | 2, 3 & 4 |
| 317 | **Jorissen** (T. M. F. C.) | Chemins de fer néerlandais | 3 & 4 |
| 318 | **Joyce Diniz** (P.) | Compagnie des chemins de fer portugais. | 2 & 4 |
| 319 | **Jullien** | Chemin de fer d'Orléans (France) | 1 & 3 |
| 320 | **Juranek** (C.) | Ministère des chemins de fer et Chemins de fer de l'Etat (Tchéco-Slovaquie) | 2 |
| 321 | **Just** | Chemins de fer du Sud de la France | 4 & 5 |
| 322 | **Kamph** (A.) | Chemin de fer Stockholm-Vesteras-Bergslagen (Suède) | 2, 3 & 5 |
| 323 | **Kay** (J. A.) | Great Western Railway (Grande-Bretagne) | 3 |
| 324 | **Keelan** (E. H.) | North Western Railway (State Railway of India) | 2, 4 & 5 |
| 325 | **Kejr** (E.) | Chemins de fer de l'Etat (Tchéco-Slovaquie) | 2 & 5 |
| 326 | **Kerry** (Right Hon. The Earl of) | Great Central Railway (Grande-Bretagne) | 1 & 4 |
| 327 | **Kimura** | South Manchuria Railway (Chine) | 2 & 3 |
| 328 | **Kirkhope** (K. M.) | Oudh & Rohilkhand Railway (Indes anglaises) | 2 & 4 |
| 329 | **Kirkness** (L. H.) | Madras & Southern Mahratta Railway (Indes anglaises) | 2, 3 & 4 |
| 330 | **Klein** (E.) | Société émilienne de chemins de fer, tramways et automobiles (Italie) | 3 & 5 |
| 331 | **Kock** (P.) | Chemin de fer Mellersta-Oestergötland (Suède) | 1, 2 & 3 |
| 332 | **Kraus** (D$^{r}$ J.) | Compagnie des chemins de fer des Indes néerlandaises | 3 & 4 |
| 333 | **Krayenhoff** (baron C. R. T.). | Chemins de fer néerlandais | 1, 2 & 3 |
| 334 | **Kume** (J.) | Ministère des communications (Japon) | 2, 3 & 5 |
| 335 | **Kunz** (G.) | Chemin de fer des Alpes bernoises (Berne-Lötschberg-Simplon) (Suisse). | 4 |
| 336 | **Labarre** (E.) | Chemins de fer de l'Est (France) | 2 & 3 |
| 337 | **L'Abbate** (D.) | Fédération des transports (Italie) | 3 & 5 |
| 338 | **Lacoin** | Chemin de fer d'Orléans (France) | 2, 3 & 4 |

| Number. | NAME. | DELEGATED BY | SECTIONS. |
|---|---|---|---|
| 339 | **Lamalle** (U.) | Ministère des chemins de fer, marine, postes et télégraphes et Chemins de fer de l'Etat belge | 1, 2, 3, 4 & 5 |
| 340 | **Lancrenon** | Chemins de fer de Paris à Lyon et à la Méditerranée (France) | 2 & 4 |
| 341 | **Lanino** (P.) | Ministère des travaux publics (Italie) | 2, 3 & 5 |
| 342 | **Lanzerotti** (E.) | Ministère des travaux publics (Italie) | 2 & 5 |
| 343 | **Lazard** | Chemins de fer de l'Est brésilien | 4 |
| 344 | **Leder** (W.) | Chemin de fer de la vallée de Birsig (Suisse) | 2, 3 & 5 |
| 345 | **Ledoux** | Chemins de fer du Midi (France) | 2 |
| 346 | **Leemans** (C.) | Chemins de fer néerlandais | 1 |
| 347 | **Lefort** (A.) | Direction générale des travaux publics (Luxembourg) | 3, 4 & 5 |
| 348 | **Lembourg** (G.) | Société nationale des chemins de fer vicinaux (Belgique) | 5 |
| 349 | **Lemonnier** (G.) | Chemins de fer Départementaux du Tarn (France) | 5 |
| 350 | **Level** (F.) | Compagnie générale de voies ferrées d'intérêt local (France) | 3, 4 & 5 |
| 351 | **Level** (G.) | Société générale des chemins de fer économiques (France) | 3 & 5 |
| 352 | **Levie** (M.) | Société nationale des chemins de fer vicinaux (Belgique) | 5 |
| 353 | **Lieb** (J. W.) | Secrétariat d'Etat (Etats-Unis d'Amérique) | 2 |
| 354 | **Ligabue** (A.) | Fédération des transports (Italie) | 1 |
| 355 | **Lincoln** (N.) | Bombay, Baroda & Central India Railway | 2, 3 & 4 |
| 356 | **Lindgren** (E. M.) | Société du chemin de fer de Norra-Oestergötland (Suède) | 1, 2 & 3 |
| 357 | **Lindström** (V.) | Chemin de fer Halmstad-Nässjö (Suède). | 1, 2, 3 & 4 |
| 358 | **Lingard** (H.) | Madras & Southern Mahratta Railway (Indes anglaises) | 1 |
| 359 | **Lissoni** (E.) | Société italienne des chemins de fer de la Méditerranée (Italie) | 3, 4 & 5 |
| 360 | **Locatelli** (H.) | Société des chemins de fer de l'Apennin central (Italie) | 5 |
| 361 | **Lolli** (F.) | Chemins de fer de l'Etat italien | 1 & 4 |
| 362 | **Loneux** (de) | Ministère des chemins de fer, marine, postes et télégraphes (office de l'électricité) (Belgique) | 2 |
| 363 | **Loney** (H. F.) | Midland Railway (Grande-Bretagne) | 3 & 4 |
| 364 | **Loret** (M.) | Ministère des chemins de fer (Pologne). | 3 & 4 |
| 365 | **Lorieux** (L.) | Chemin de fer de Dakar à Saint-Louis (Sénégal) | & 4 |
| 366 | **Lowther** (E.) | Great Western Railway (Grande-Bretagne) | 1, 2, 3 & 4 |
| 367 | **Luuyt** | Chemins de fer algériens de la Compagnie de Paris à Lyon et à la Méditerranée | 1, 2, 3 & 4 |
| 368 | **Luzzati** (R.) | Société du chemin de fer du Nord de Milan (Italie) | 2, 3 & 5 |
| 369 | **Luzzatti** (G.) | Société pour le chemin de fer complémentaire de la Sardaigne (Italie) | 3, 4 & 5 |
| 370 | **Maas-Geesteranus** (H. P.) | Chemins de fer néerlandais | 1 & 3 |
| 371 | **Maccaferri** (U.) | Ministère des travaux publics (Italie) | 1, 2 & 3 |

| Number | NAME. | DELEGATED BY | SECTIONS. |
|---|---|---|---|
| 372 | **Maccallini** (L.) | Chemins de fer de l'Etat italien | 3 & 4 |
| 373 | **Machado** (C. A. P.) | Ministère du commerce et des communications (Portugal) | 1, 2, 4 & 5 |
| 374 | **Maconochie** (A. W.) | Great Eastern Railway (Grande-Bretagne) | 2, 4 & 5 |
| 375 | **Madden** (J. C. W.) | Great Northern Railway (Ireland) | 1, 3 & 4 |
| 376 | **Maffezzoli** (A.) | Fédération des transports (Italie) | 1, 3 & 5 |
| 377 | **Maguire** (M.) | Dublin & South Eastern Railway (Ireland) | 4 |
| 378 | **Maison** (F.) | Ministère des travaux publics (France). | 2, 3 & 4 |
| 379 | **Malcolm** (B.) | Midland Railways (Northern Counties Committee) (Grande-Bretagne) | 1, 2 & 3 |
| 380 | **Mallez** | Régie départementale des tramways de l'Ain (France) | 5 |
| 381 | **Mange** | Chemin de fer d'Orléans (France) | 2, 3 & 4 |
| 382 | **Marchand** | Chemins de fer de l'Etat chinois | 2 |
| 383 | **Margotta** (V.) | Commission permanente de l'Association (section italienne) et Chemins de fer de l'Etat italien | 1 |
| 384 | **Marguerat** (A.) | Chemin de fer de Viège à Zermatt (Suisse) | 5 |
| 385 | **Maristany** (C.) | Chemins de fer de Madrid à Saragosse et à Alicante (Espagne) | 4 |
| 386 | **Marriott** (H.) | Lancashire & Yorkshire Railway (Grande-Bretagne) | 3, 4 & 5 |
| 387 | **Marriott** (W.) | Midland Railways & Great Northern Joint Committee (Grande-Bretagne) | 1 |
| 388 | **Maryssael** (L.) | Tramways et chemins de fer économiques Rome, Milan, Bologne, etc. (Italie) | 5 |
| 389 | **Marzollo** (C.) | Commission permanente de l'Association (section italienne) | 4 & 5 |
| 390 | **Massó Casañas** (A.) | Chemins de fer de Medina del Campo à Zamora et Orense à Vigo (Espagne) | 3 & 4 |
| 391 | **Matheson** (D. A.) | Caledonian Railway (Grande-Bretagne). | 1 & 4 |
| 392 | **Mattsson** (J.) | Chemin de fer de Norsholm-Westervik-Hultsfred (Suède) | 4 & 5 |
| 393 | **Maudsley** (J.) | Ministère des communications (Egypte). | 1, 2, 3 & 4 |
| 394 | **Mauldin** (H. H.) | Great Eastern Railway (Grande-Bretagne) | 2 & 3 |
| 395 | **Maunsell** (R. E. L.) | South Eastern & Chatham Railway (Grande-Bretagne) | 2 |
| 396 | **Mauris** | Commission permanente de l'Association et Chemins de fer de Paris à Lyon et à la Méditerranée (France) | 2 & 4 |
| 397 | **Mayer** (G.) | Commission permanente de l'Association (secrétaire de section) | 1 & 4 |
| 398 | **Mazza** (U.) | Société du chemin de fer du Nord de Milan (Italie) | 3 |
| 399 | **Menada** (G.) | Société pour les chemins de fer de Reggio-Emilia (Italie) | 4 & 5 |
| 400 | **Mengoni** (A.) | Commission permanente de l'Association (section italienne) et Chemins de fer de l'Etat italien | 1 |
| 401 | **Mercier-Dufour** (J. J.) | Chemin de fer de Lausanne à Ouchy (Suisse) | 4 & 5 |
| 402 | **Mereutza** (C.) | Chemins de fer de l'Etat roumain | 4 & 5 |

| Number | NAME. | DELEGATED BY | SECTIONS. |
|---|---|---|---|
| 403 | **Mesnager** | Ministère des travaux publics (France). | 1 |
| 404 | **Mezger** | Chemins de fer fédéraux (Suisse) | 1 |
| 405 | **Michaut** (J. E.) | Société générale des chemins de fer économiques (France) | 2, 4 & 5 |
| 406 | **Middelberg** (M.) | Chemins de fer de l'Etat aux Indes néerlandaises | 3 & 5 |
| 407 | **Migliau** (I.) | Fédération des transports (Italie) | 2 |
| 408 | **Minsart** | Commission permanente de l'Association, Ministère des chemins de fer, marine, postes et télégraphes et Chemins de fer de l'Etat belge | 1, 2 & 3 |
| 409 | **Miomandre** (G. de) | Tramways de Lombardie et Romagnes (Italie) | 4 & 5 |
| 410 | **Monard** (J.) | Chemin de fer de Grande-Banlieue (France) | 1 |
| 411 | **Monod** (J. P.). | Chemin de fer de Smyrne-Cassaba et prolongement (Asie mineure) | 3 & 4 |
| 412 | **Morales y Lopez Higuera** (L.) | Ministère du fomento (Espagne) | 3 & 4 |
| 413 | **Morgan** (C. L.) | London Brighton & South Coast Railway (Grande-Bretagne) | 4 |
| 414 | **Morland** | Chemins de fer de l'Est brésilien | 1 & 3 |
| 415 | **Morse** (R. C. J.) | Pennsylvania System (Etats-Unis d'Amérique) | 3 |
| 416 | **Moutier** | Chemin de fer du Nord (France) | 1, 3 & 4 |
| 417 | **Muntz** | Compagnie internationale des wagons-lits et des grands express européens. (Belgique) | 2 |
| 418 | **Nagel** (C.) | Commission permanente de l'Association (section italienne) | 2 & 5 |
| 419 | **Nasse** | Chemins de fer de l'Etat français | 2, 3 & 4 |
| 420 | **Natoli** | Chemin de fer Circumetnea (Société sicilienne de travaux publics) (Italie) | 3, 4 & 5 |
| 421 | **Nawa** (Dr M.) | Ministère des communications (Japon) | 1 & 2 |
| 422 | **Neachell** (E. J.) | Liverpool Overhead Railway (Grande-Bretagne) | 1, 3 & 5 |
| 423 | **Neef** (A.) | Compagnie internationale des wagons-lits et des grands express européens (Belgique) | 2 & 4 |
| 424 | **Nerell** (O.) | Chemin de fer Stockholm-Roslag (Suède) | 2, 3 & 5 |
| 425 | **Netti** (A.) | Ministère des travaux publics (Italie) | 2 |
| 426 | **Neville** (E. A.) | Bengal & North Western Railway (Indes anglaises) | 1, 3, 4 & 5 |
| 427 | **Nicholls** (R. H.) | Great Western Railway (Grande-Bretagne) | 3 & 4 |
| 428 | **Nicoli** (N.) | Commission permanente de l'Association (section italienne) et Chemins de fer de l'Etat italien. | 2 |
| 429 | **Nitesco** (E.) | Chemins de fer de l'Etat roumain | 3 & 4 |
| 430 | **Noblemaire** (A.) | Compagnie internationale des wagons-lits et des grands express européens (Belgique) | 2, 3 & 4 |
| 431 | **Nollet** (E.) | Commission permanente de l'Association (secrétariat du comité) | 2 & 4 |
| 432 | **Nonaka** | South Manchuria Railway (Chine) | 2, 3 & 5 |
| 433 | **Nordlien** (F. T. M. M.) | Ministère des travaux publics (Danemark) | 3, 4 & 5 |

| Number. | NAME. | DELEGATED BY | SECTIONS. |
|---|---|---|---|
| 434 | **Nordström** (F.) | Société du chemin de fer Gefle-Dala (Suède) | 2 |
| 435 | **Norrby** (A.) | Chemin de fer Bergslagen (Suède) | 3, 4 & 5 |
| 436 | **Nyström** (J.) | Chemin de fer Västergötland-Göteborg (Suède) | 1 & 3 |
| 437 | **O'Connor** (M. S. S.) | Oudh & Rohilkhand Railway (Indes anglaises) | 3 & 4 |
| 438 | **Öfverholm** (I.) | Chemins de fer de l'Etat (Suède) | 2 |
| 439 | **Olanda** | Chemins de fer du Nord de l'Espagne | 2, 3 & 4 |
| 440 | **Oliveira Simões** (J. de) | Ministère du commerce et des communications (Portugal) | 2 & 3 |
| 441 | **Orso** (Q.) | Commission permanente de l'Association (section italienne) et Chemins de fer de l'Etat italien | 2 |
| 442 | **Oshima** (K.) | Ministère des communications (Japon). | 3 & 4 |
| 443 | **Ottone** (G.) | Commission permanente de l'Association (section italienne) et Société nationale de chemins de fer et de tramways (Italie) | 2, 4 & 5 |
| 444 | **Ouang Hang** | Ministère des communications (Chine) | 1 & 3 |
| 445 | **Pader** | Chemins de fer d'Alsace et de Lorraine | 3 & 4 |
| 446 | **Padovano** (S.) | Société anonyme pour les chemins de fer vicinaux (Italie) | 2 & 3 |
| 447 | **Painter** (E. E.) | Railway Clearing House (Grande-Bretagne) | 4 |
| 448 | **Paiva Couceiro** (M. de) | Commission permanente de l'Association (secrétaire de section) | 2 |
| 449 | **Palmer** (F.) | Bombay, Baroda & Central India Railway | 1 |
| 450 | **Panaïtopol** | Chemins de fer de l'Etat roumain | 2 |
| 451 | **Paris** | Chemin de fer du Nord (France) | 1 |
| 452 | **Parish** (W.) | Buenos Ayres Great Southern Railway (République Argentine) | 3 & 4 |
| 453 | **Parisi** (E.) | Société nationale de chemins de fer et de tramways (Italie) | 5 |
| 454 | **Parodi** | Chemin de fer d'Orléans (France) | 1, 2 & 3 |
| 455 | **Pasini** (A.) | Fédération des transports (Italie) | 2, 3 & 5 |
| 456 | **Pasquier** (P.) | Compagnie générale de chemins de fer et tramways en Chine | 1, 2 & 3 |
| 457 | **Paternotte** (A.) | Chemin de fer d'Eecloo à Bruges (Belgique) | 2 |
| 458 | **Pattin** (C.) | Compagnie Meusienne de chemins de fer (France) | 5 |
| 459 | **Pattison** (H.) | Illinois Central Railroad (Etats-Unis d'Amérique) | 2 |
| 460 | **Paul** | Chemins de fer du Midi (France) | 4 |
| 461 | **Paul-Dubois** | Chemin de fer d'Orléans (France) | 2, 3 & 4 |
| 462 | **Payet** | Chemins de fer de l'Etat français | 2, 3 & 4 |
| 463 | **Pédron** | Chemins de fer des Côtes-du-Nord (France) | 5 |
| 464 | **Peironcely** (R.) | Compagnie des chemins de fer de Madrid à Saragosse et à Alicante (Espagne) | 3, 4 & 5 |
| 465 | **Pellé** (M.) | Compagnie des Phosphates et du Chemin de fer de Gafsa (Tunisie) | 1, 2 & 5 |
| 466 | **Pellegrini** (M.) | Société du chemin de fer Central et tramways du Canavèse (Italie) | 2, 3 & 5 |

| Number. | NAME. | DELEGATED BY | SECTIONS. |
|---|---|---|---|
| 467 | **Perdrix** | Régie des chemins de fer départementaux des Bouches-du-Rhône (France) | 2 & 5 |
| 468 | **Perrier** | Chemins de fer de l'Etat français | 1 & 5 |
| 469 | **Peychez** | Chemins de fer d'Alsace et de Lorraine | 1, 3 & 4 |
| 470 | **Philippe** (G.) | Commission permanente de l'Association et Chemin de fer du Nord français (lignes Nord-Belges) | 3 & 5 |
| 471 | **Pietri** (G. G.) | Commission permanente de l'Association (section italienne) et Chemins de fer de l'Etat italien | 1, 3 & 4 |
| 472 | **Pirard** (A.) | Compagnie générale de chemins de fer catalans (Espagne) | 1, 2 & 5 |
| 473 | **Pisa** (P.) | Chemin de fer de Suzzara-Ferrara (Italie) | 5 |
| 474 | **Polart** | Chemins de fer de l'Etat français | 2, 3 & 4 |
| 475 | **Pole** (F. J. C.) | Great Western Railway (Grande-Bretagne) | 3 & 4 |
| 476 | **Poli** (D.) | Société vénitienne pour la construction et l'exploitation de chemins de fer secondaires en Italie | 4 |
| 477 | **Pretorian** (S.) | Chemins de fer de l'Etat roumain | 1, 3 & 4 |
| 478 | **Price** (P. H.) | Railway Clearing House (Grande-Bretagne) | 4 |
| 479 | **Pringle** (J. W.) | Ministère des transports (Grande-Bretagne) | 1, 2 & 5 |
| 480 | **Proença Vieira** (A. J. de) | Chemins de fer de l'Etat (Portugal) | 1, 2, 3 & 4 |
| 481 | **Queiroz e Vasconcellos** (A. de) | Ministère du commerce et des communications (Portugal) | 1 & 5 |
| 482 | **Quinquet** | Chemins de fer de Paris à Lyon et à la Méditerranée (France) | 1 |
| 483 | **Quirey** (J.) | Midland Railways & Great Northern Joint Committee (Grande-Bretagne) | 4 |
| 484 | **Rammeskov** (C. A.) | Chemin de fer privé d'Aalborg (Danemark) | 2, 4 & 5 |
| 485 | **Ramsay** (C. H.) | Chemin de fer Mellersta-Oestergötland (Suède) | 5 |
| 486 | **Rasmussen** (C. I. E.) | Chemins de fer de l'Etat danois | 2 |
| 487 | **Regnauld** | Chemins de fer d'Alsace et de Lorraine | 1 |
| 488 | **Reid** (R. W.) | Midland Railway (Grande-Bretagne) | 2, 3 & 4 |
| 489 | **Renard** (C.) | Chemins de fer de Saône-et-Loire (France) | 5 |
| 490 | **Rendell** (T. H.) | Barry Railway (Grande-Bretagne) | 3 |
| 491 | **Rennes** | Chemins de fer andalous (Espagne) | 2 |
| 492 | **Rey** (L.) | Chemins de fer du Cambrésis (France) | 1, 4 & 5 |
| 493 | **Riboud** | Chemins de fer de l'Est (France) | 2, 3 & 4 |
| 494 | **Richemond** | Chemin de fer d'Orléans (France) | 2 & 4 |
| 495 | **Rio** (R. **del**) | Ministère des chemins de fer (Chili) | 3 |
| 496 | **Rivet** | Ministère des travaux publics (France) | 2 |
| 497 | **Robaglia** | Chemin de fer de Ceinture de Paris | 4 & 5 |
| 498 | **Robinson** (J.) | Glasgow & South Western Railway (Grande-Bretagne) | 1 & 5 |
| 499 | **Robinson** (J. G.) | Great Central Railway (Grande-Bretagne) | 2, 3 & 4 |
| 500 | **Rose** (C. G.) | North Staffordshire Railway (Grande-Bretagne) | 1 |
| 501 | **Rose** (D.) | Illinois Central Railroad (Etats-Unis d'Amérique) | 4 |

| Number. | NAME. | DELEGATED BY | SECTIONS. |
|---|---|---|---|
| 502 | **Ross** (A. P.) | Cheshire Lines Committee (Grande-Bretagne) | 1 |
| 503 | **Roume** | Chemin de fer d'Orléans (France) | 3 & 4 |
| 504 | **Rune** (A.) | Chemin de fer de Norsholm-Westervik-Hultsfred (Suède) | 4 |
| 505 | **Rutherford** (D. L.) | Furness Railway (Grande-Bretagne) | 1, 2 & 3 |
| 506 | **Sabouret** | Chemin de fer d'Orléans (France) | 1 & 2 |
| 507 | **Salinas** (V.) | Ministère du fomento (Espagne) | 1, 2 & 4 |
| 508 | **Salto** (L.) | Chemins de fer de Madrid à Saragosse et à Alicante (Espagne) | 2 & 3 |
| 509 | **Salvadori di Wiesenhoff** (G.) | Société turinoise de tramways et de chemins de fer économiques (Italie) | 5 |
| 510 | **Sandberg** (C. P.) | Ministère des communications (Chine) et Ministère des voies de communication (Siam) | 1 & 2 |
| 511 | **Sapin** (C.) | Chemins de fer du Sud-Ouest (France) | 3 & 5 |
| 512 | **Sapin** (H.) | Chemins de fer d'intérêt local de l'Yonne (France) | 5 |
| 513 | **Sapuppo** (A.) | Commission permanente de l'Association (section italienne) et Chemins de fer de l'Etat italien | 4 |
| 514 | **Sato** (S.) | South Manchuria Railway (Chine) | 3 & 4 |
| 515 | **Saunders** (H. H.) | North Western Railway (State Railway of India) | 2, 4 & 5 |
| 516 | **Saxegaard** | Chemins de fer de l'Etat (Norvège) | 1, 3, 4 & 5 |
| 517 | **Sayers** (J.) | Great Central & Midland Joint Committee (Grande-Bretagne) | 3 & 4 |
| 518 | **Schaff** (F. A.) | Kansas City Southern Railway (Etats-Unis d'Amérique) | 2 |
| 519 | **Schiavon** (A.) | Chemins de fer de l'Etat italien | 1, 3, 4 & 5 |
| 520 | **Schleiter** (W. F.) | Secrétariat d'Etat (Etats-Unis d'Amérique) | 1 |
| 521 | **Schrafl** | Chemins de fer fédéraux (Suisse) | 1, 2 & 3 |
| 522 | **Schreiner** | Chemins de fer de l'Etat (Norvège) | 2 |
| 523 | **Schultz** (C. A.) | Chemins de fer de l'Etat (Suède) | 1 |
| 524 | **Scialoja** (E.) | Société nationale de chemins de fer et de tramways (Italie) | 4 & 5 |
| 525 | **Sechino** (R.) | Ministère des travaux publics (République Dominicaine) | 4 |
| 526 | **Seiler** | Chemins de fer fédéraux (Suisse) | 4 |
| 527 | **Séjourné** | Chemins de fer algériens de la Compagnie de Paris à Lyon et à la Méditerranée | 1 |
| 528 | **Selbie** (R. H.) | Metropolitan Railway (Grande-Bretagne) | 2, 3 & 4 |
| 529 | **Selway** (C. J.) | Great Northern Railway (Grande-Bretagne) | 3, 4 & 5 |
| 530 | **Semenza** (G.) | Ministère des travaux publics (Italie) | 2 & 5 |
| 531 | **Serani** (D.) | Commission permanente de l'Association (section italienne) et Chemins de fer de l'Etat italien | 1, 3 & 4 |
| 532 | **Seydoux** (E.) | Tramways de l'Indre (France) | 5 |
| 533 | **Shen Tcheng** | Chemins de fer de l'Etat chinois | 2 |
| 534 | **Sieges** (F.) | Compagnie auxiliaire internationale de chemins de fer (Belgique) | 3 |
| 535 | **Sieges** (G.) | Compagnie auxiliaire internationale de chemins de fer (Belgique) | 2 |
| 536 | **Silfverstolpe** (D. O. S.) | Chemins de fer de l'Etat (Suède) | 2 & 3 |

| Number. | NAME. | DELEGATED BY | SECTIONS. |
|---|---|---|---|
| 537 | **Simonetti** (E.) | Fédération des transports (Italie) | 1 |
| 538 | **Simon-Thomas** (W.) | Chemins de fer néerlandais | 3, 4 & 5 |
| 539 | **Singh** (Rai Bahadur B. R.). | Eastern Bengal Railway (State Railway of India) | 1 |
| 540 | **Skinas** (D.) | Ministère des communications (Grèce) | 1 & 2 |
| 541 | **Slinkers** (W. A.) | Compagnie des chemins de fer des Indes néerlandaises | 1 |
| 542 | **Smellie** (J. H.) | North Western Railway (State Railway of India) | 2, 3 & 4 |
| 543 | **Smith** (R.) | Great Western Railway (Grande-Bretagne) | 2 |
| 544 | **Smyth** (A. H.) | South Indian Railway | 1, 2 & 3 |
| 545 | **Snoy** (Baron R.). | Compagnie internationale des wagons-lits et des grands express européens (Belgique) | 2, 3 & 4 |
| 546 | **Sorel** (A.) | Chemins de fer et Minières Prince-Henri (Luxembourg) | 2, 3 & 4 |
| 547 | **Soulez** | Chemin de fer du Nord (France) | 3 & 4 |
| 548 | **Sousa** (J. F. de) | Ministère du commerce et des communications (Portugal) | 3, 4 & 5 |
| 549 | **Spiller** (H.) | Great Western Railway (Grande-Bretagne) | 3 |
| 550 | **Stahle** (V.) | Chemin de fer de Kalmar-Nya (Suède) | 1, 2 & 3 |
| 551 | **Stalder** (F.) | Département fédéral des postes et des chemins de fer (Suisse) | 1, 2 & 5 |
| 552 | **Stefini** (E.) | Ministère des travaux publics (Italie) | 1, 2, 3, 4 & 5 |
| 553 | **Stensballe** (J. P.) | Chemins de fer de la Fionie méridionale (Danemark) | 3 |
| 554 | **Stephens** (H. F.). | Kent, Somerset & Shropshire Light Railway Group (Grande-Bretagne) | 1, 4 & 5 |
| 555 | **Stephens** (J. B.) | Great Northern Railway (Ireland) | 3 & 4 |
| 556 | **Stoclet** (A.) | Chemin de fer central de Aragon (Espagne) | 2 |
| 557 | **Sugrue** (J. M.) | Cork, Bandon & South Coast Railway (Ireland) | 4 |
| 558 | **Sundberg** (P.) | Chemins de fer de l'Etat (Suède) | 1 & 2 |
| 559 | **Süss** (N.) | Chemins de fer de Madrid à Saragosse et à Alicante (Espagne) | 2, 4 & 5 |
| 560 | **Swartling** (H.) | Chemin de fer Stockholm - Vesteras - Bergslagen (Suède) | 1, 3 & 4 |
| 561 | **Szlumper** (A. W.) | London & South Western Railway (Grande-Bretagne) | 1 |
| 562 | **Tadros** (D.) | Ministère des communications (Egypte). | 4 |
| 563 | **Tainturier** | Chemins de fer de l'Etat français | 2 & 3 |
| 564 | **Tajani** (F.). | Commission permanente et Fédération des transports (Italie) | 3, 4 & 5 |
| 565 | **Takaku** (J.) | Ministère des communications (Japon) | 3 & 4 |
| 566 | **Talenti** (E.) | Commission permanente de l'Association (section italienne) et Chemins de fer de l'Etat italien | 1, 3 & 4 |
| 567 | **Tanaka** (K.) | Ministère des communications (Japon) | 2 & 5 |
| 568 | **Tang-Fong Sian** | Ministère des communications (Chine) | 1 |
| 569 | **Tartary** (G.) | Tramways départementaux des Deux-Sèvres (France) | 3 & 5 |
| 570 | **Tatlow** (F.) | Midland Railway (Grande-Bretagne) | 2, 3 & 4 |

| Number | NAME. | DELEGATED BY | SECTIONS. |
|---|---|---|---|
| 571 | **Taylor** (H. B.) | Secrétariat d'Etat pour l'Empire des Indes | 1 & 3 |
| 572 | **Teague** (G. W.) | North Western of Uruguay Railway | 2, 3 & 4 |
| 573 | **Teissier** (G.) | Chemins de fer du Midi (France) | 3 & 4 |
| 574 | **Terme** | Chemins de fer d'Alsace et de Lorraine | 2 |
| 575 | **Tettelin** | Chemin de fer du Nord (France) | 1, 3 & 4 |
| 576 | **Thonet** (C.) | Tramways de Lombardie et Romagnes (Italie) | 2, 4 & 5 |
| 577 | **Thornton** (Sir Henry W.) | Great Eastern Railway (Grande-Bretagne) | 1, 2 & 3 |
| 578 | **Thott** (Baron A.) | Chemin de fer Helsingborg-Hessleholm (Suède) | 1, 2 & 3 |
| 579 | **Tiemroth** (Chr.) | Chemin de fer de l'Est de Seeland (Danemark) | 4 |
| 580 | **Tintant** | Chemins de fer de l'Est (France) | 1 |
| 581 | **Tollerton** (W. J.) | American Railway Association | 2 & 4 |
| 582 | **Tondelier** (V.) | Commission permanente de l'Association, Ministère des chemins de fer, marine, postes et télégraphes et Chemins de fer de l'Etat belge | 1, 3 & 4 |
| 583 | **Tondelli** (V.) | Commission permanente de l'Association (section italienne) et Chemins de fer de l'Etat italien | 2, 3 & 4 |
| 584 | **Torrens** (J. A.) | Midland Railways (Northern Counties Committee) (Grande-Bretagne) | 2 & 3 |
| 585 | **Torres** (C. M. F.) | Chemins de fer de l'Etat (Portugal) | 3, 4 & 5 |
| 586 | **Travis** (C.) | Great Central Railway (Grande-Bretagne) | 3 & 4 |
| 587 | **Trench** (E. F. C.) | London & North Western Railway (Grande-Bretagne) | 1 |
| 588 | **Tronconi** (G.) | Chemins de fer de l'Etat italien | 1 |
| 589 | **Trotter** (C. W.) | Hull & Barnsley Railway (Grande-Bretagne) | 2 & 4 |
| 590 | **Tsang Ou** | Ministère des communications (Chine) | 4 & 5 |
| 591 | **Tujague** | Chemins de fer algériens de l'Etat | 1, 2, 3, 4 & 5 |
| 592 | **Turton** (E. R.) | Railway Clearing House (Grande-Bretagne) | 4 |
| 593 | **Uytborck** (E.) | Commission permanente de l'Association (secrétaire de section) | 2 |
| 594 | **Valarino** (T. R.) | Chemins de fer du Nord de l'Espagne | 3 |
| 595 | **Vallantin** | Chemins de fer de Paris à Lyon et à la Méditerranée (France) | 2, 3 & 4 |
| 596 | **Vallecchi** | Commission permanente de l'Association (secrétaire de section) | 5 |
| 597 | **Vanden Savel** (J.) | Chemin de fer du Tessin (Italie) | 3 & 4 |
| 598 | **Vanderlinden** (J.) | Société nationale des chemins de fer vicinaux (Belgique) | 1, 4 & 5 |
| 599 | **Van der Minne** (H.) | Ministère du waterstaat (Pays-Bas) | 1, 3 & 4 |
| 600 | **Van Loenen Martinet** (J. J. W.) | Chemins de fer néerlandais | 2 |
| 601 | **Van Manen** (H.) | Chemins de fer néerlandais | 3 & 4 |
| 602 | **Van Schouwenburg** (W. H.) | Compagnie des chemins de fer des Indes néerlandaises | 2 |
| 603 | **Vargas** (F. de) | Chemins de fer du Nord de l'Espagne | 2 & 3 |
| 604 | **Vasconcellos Correia** (A. de) | Compagnie des chemins de fer portugais. | 2, 3 & 4 |
| 605 | **Vée** (V.) | Chemins de fer de l'Est brésilien | 5 |

| Number. | NAME. | DELEGATED BY | SECTIONS. |
|---|---|---|---|
| 606 | **Verdeyen** (J.) | Commission permanente de l'Association, Ministère des chemins de fer, marine, postes et télégraphes et Chemins de fer de l'Etat belge | 1 & 3 |
| 607 | **Verwilghen** (A.) | Chemin de fer international de Malines-Terneuzen (Belgique) | 3 & 4 |
| 608 | **Vezzani** | Commission permanente de l'Association (secrétaire de section) | 5 |
| 609 | **Viallefond** | Commission permanente de l'Association (secrétaire de section) | 1 |
| 610 | **Viglione** (O.) | Chemins de fer de l'Etat italien | 2, 3 & 4 |
| 611 | **Vigna** (A.) | Chemins de fer de l'Etat italien | 3 |
| 612 | **Villa** (F.) | Chemins de fer de l'Etat italien | 3 |
| 613 | **Vos van Nederveen Cappel** (G. J. de) | Chemins de fer néerlandais | 1 & 3 |
| 614 | **Wachtmeister** (Comte A.) | Blekingekustbanor (Suède) | 1 & 2 |
| 615 | **Walentin** (B.) | Chemins de fer Norrköping-Söderköping-Vikbolandets (Suède) | 3 |
| 616 | **Walker** (Sir Herbert A.) | London & South Western Railway (Grande-Bretagne) | 1, 2 & 3 |
| 617 | **Waru** (M. de) | Chemin de fer du Nord (France) | 4 |
| 618 | **Watermeyer** (T. H.) | South African Railways & Harbours | 1, 2 & 5 |
| 619 | **Waters** (H. H.) | London & North Western Railway (Grande-Bretagne) | 3 |
| 620 | **Watson** (A.) | Commission permanente de l'Association, Lancashire & Yorkshire Railway et London & North Western Railway (Grande-Bretagne) | 2, 3 & 4 |
| 621 | **Weiss** | Chemins de fer fédéraux (Suisse) | 2 & 3 |
| 622 | **Wester** (R.) | Chemin de fer Uddevalla-Venersborg-Herrljunga (Suède) | 1, 3 & 5 |
| 623 | **Wilbur** (R. H.) | Lehigh & New England Railroad (Etats-Unis d'Amérique) | 1, 2 & 4 |
| 624 | **Wildhagen** | Compagnie internationale des wagons-lits et des grands express européens (Belgique) | 3 |
| 625 | **Willem** | Ministère des chemins de fer, marine, postes et télégraphes et Chemins de fer de l'Etat belge | 1 |
| 626 | **Williamson** (J.) | Entre Rios Railways (République Argentine) | 3 & 4 |
| 627 | **Wilson-Barker** (Sir David) | Nitrate Railways (Chili) | 2 & 3 |
| 628 | **Wiman** (A.) | Chemin de fer Halmstad-Nässjö (Suède) | 3 & 5 |
| 629 | **Wohler** (A.) | Chemin de fer Rhétique (Suisse) | 3 & 5 |
| 630 | **Wood** (W. B.) | Pennsylvania System (Etats-Unis d'Amérique) | 4 & 5 |
| 631 | **Woodin** (W. H.) | Lehigh Valley Railroad (Etats-Unis d'Amérique) | 2 |
| 632 | **Woytt** (F.) | Compagnie internationale des wagons-lits et des grands express européens (Belgique) | 2, 3 & 4 |
| 633 | **Yarnall** (C.) | Buffalo, Susquehanna Railroad (Etats-Unis d'Amérique) | 1 |
| 634 | **Zachariae** (R. N.) | Chemins de fer de l'Etat danois | 3 & 4 |
| 635 | **Zachariah** (O.) | South African Railways & Harbours | 3 & 4 |
| 636 | **Zanotta** (A.) | Chemins de fer de l'Etat italien | 1 & 3 |
| 637 | **Zutter** | Commission permanente de l'Association (secrétaire de section) | 4 |

# FORMAL OPENING

## at 3 p. m., on 18 April 1922,

## IN THE GREAT HALL OF THE PALACE OF EXHIBITIONS AT ROME

Mr. Riccio, minister of public works, on behalf of the Italian Government, gave an address of welcome to the members of the ninth Congress of the International Railway Association. He had with him on the platform : Messrs. V. Tondelier, president of the Permanent Commission, Colson and Ernest Gerard, vice-presidents, Crova, director general of the Italian State Railways, J. Verdeyen, general secretary, and numerous members of the Permanent Commission.

The formal opening was honoured by the presence of His Majesty, Victor Emmanuel III, King of Italy.

Mr. Riccio delivered the following address :

« Your Majesty,

« Gentlemen,

« The ninth Congress of the International Railway Association, of which I have the honour to be president, is being inaugurated today in our immortal Rome, which is proud to receive you as guests, and offers you a most cordial welcome.

« In the name of the Italian Government I wish to express the gratitude we feel in having our Country chosen as the seat of this meeting, which is the first since the war. Its work naturally cannot fail to be influenced by the effects of the relations created by the disturbance the world has just passed through. Unfortunately the fruits of a true peace have not yet matured; the work of reconstruction is slow and difficult, and the question of transports is directly and intimately connected with it. Your discussions bearing as they will on the rapid and constant improvement of the means of communication and exchange between nations will therefore have the utmost importance towards the solution of a crisis which is not yet solved.

« The Italian Government also offers its thanks to the Sovereigns and heads of States who have so kindly sent their representatives to the Congress. The presence and collaboration of such illustrious personages will be of the utmost value to us.

« On referring some days ago to the reports of your Association, I was greatly struck by the account of the second session which was held at Milan from the 17 to the 24 September 1887. This was presided over by Mr. Saracco, then our minister of public works, who delivered the opening speech of the Congress.

« I have re-read his address with great interest, and it has made me realise the very considerable progress made by my country in railway matters during the course of the last thirty-five years. After having referred to the Belgian Minister of Railways' speech at the first Congress held at Brussels in 1885, and recalling with the greatest admiration the proportion then reached by that laborious and industrial country of nearly 24 miles of railway lines for every 100 square miles of surface (a proportion destined to increase rapidly by the addition of a vast network of secondary railways), my eminent predecessor exclaimed :

« Unfortunately I am not in a position « to speak in the same way. No, Italy « has not yet reached, indeed is far from « having reached the place which is due « to her amongst European nations in « railway development. If our Nation, « although full of ambition to attain her « rightful position, has so far been un« able to reach it, while other peoples « have entered vigorously into the work « of developing their lines, it is because « Italy was suffering from the results of « the policy of Metternich and the Holy « Alliance, who specially suspected and « feared railways, looking upon them, not « without reason, as revolutionary ele« ments. »

« Reminding the assembly that transportation is the predominant factor in the activity of each individual and in the national life of civilised peoples, Mr. Saracco added :

« It is in this direction, Gentlemen, that « we intend to continue the noble tradi« tions of our fathers. It is not our « fault that Italy has still regions which « are either scantily served or even « without railways. With the help of « God we shall know how to settle this « national debt without exceeding the « limits of a wise prudence, since in fact « it is only through the victories of peace « and miracles of industry that the true « greatness and glory which we should « honour on earth can come. »

« With the assistance of God, Gentlemen, the debt has been paid. Italy has known how to achieve her object, and notwithstanding inevitable mistakes, technical and financial difficulties, she has carried out the solemn engagement of her Minister. What a difference between our railways in 1887 and those which in 1922 now serve our country !

« Your Majesty,
« Gentlemen,

« Will you permit me in my pride as an Italian to sum up in a few figures the progress we have made in less than seven lustrums.

« In 1886 the extent of our lines was 6 680 miles of main railway and 280 miles of secondary lines, giving a total of 6 960 miles in operation. This works out to 6.290 miles of steam railroad per 100 square miles of our territory.

« In 1921 the total length of the lines (belonging both to the State and private enterprises) reached the total of 12 842 miles, of which 10 968 are ordinary railways and 1 874 are secondary lines, giving a proportion of 10.738 miles of line per 100 square miles.

« In these figures is included the increase brought to the Italian State by the addition of new territories through the Peace Treaty. This increase of territory has given us 648 miles of ordinary lines and 225 miles of narrow gauge, there being 9.777 miles of line per 100 square miles of area.

« The length of lines now worked by the State is :

9 749 miles standard gauge;
410 miles narrow gauge;
137 miles, colonial railways, narrow gauge.

« In addition, the lines worked by private enterprise are :

1 219 miles of standard gauge;
1 465 miles narrow gauge.

« We have still under construction :

*a*) State Railways :

436 miles standard gauge;
114 miles narrow gauge.

*b*) Private enterprise :

683 miles of standard and narrow gauge lines.

« Finally, there are under consideration :

*a*) State Railways :

205 miles standard gauge;
497 miles narrow gauge.

*b*) Private enterprise :

181 miles in all.

« As you see, Italy has resolutely faced the problem of the complete development of her railway system in order to put herself on the same level as other better equipped States. Allowance, moreover, should be made for the great difficulties that she has had and still has to solve in consequence of the physical features of the country, which is chiefly mountainous, and necessitates the construction of important engineering works and the making of numerous and long tunnels, which increases the expense and hinders the speed at which the work can be carried out. Nevertheless, Italy has not refused any sacrifice and has always been in the forefront when it has been a question of improving her plant, perfecting her service and ensuring the well being of her personnel. We are now devoting ourselves to the consideration and execution of a vast electrification scheme which you will examine and have the opportunity of discussing.

« I hope you will visit the work that is already begun, for I am sure this will enable you to realise the efforts we have made.

« Your Majesty,
« Gentlemen,

« From Ancient Rome, whose glorious ruins still defy the dilapidation of centuries, we inherited a whole system of military roads which extended to her most remote colonies.

« Today the railway has taken the place of ordinary roadways, its function being not only economical, but political in the highest sense of the word; by crossing frontiers it aims at the fraternity of nations.

« It may be that recent years has shown us that this aim is still short of achievement, but we should look to the future, — a future radiant with peace and general well being.

« It is with the thought of that future that we claim in the world our share of activity and work.

« You are assembled here to discuss important technical and administrative problems concerning international railway traffic; your great knowledge and your regard for the mission entrusted to you makes me certain that the labours of this session will produce the most satisfactory results. The honour of the success will be yours, but I believe that I voice the general feeling when I express our profound gratitude to the animating force of this magnificent organisation, the International Railway Association, which I here salute in the person of its illustrious president, Mr. TONDELIER, and his worthy general secretary, Mr. VERDEYEN. This homage to those present however would not be complete if I did not recall at the same time the memory of one of your colleagues, whose recent loss has saddened us so much, Mr. WEISSENBRUCH, who was until the last day of his life the soul of the Association.

« Gentlemen,

« The programme of our session gives us the opportunity of visiting our most important railway establishments and also the works of one of our industrial centres, which is situated not far from Rome. Perhaps some, prolonging their sojourn in Italy, will wish to extend the sphere of their visits. We shall be happy to assist in every way those who would like to do so; they will see that notwithstanding the general crisis, the painful effects of which are felt by the entire world, Italy is working and producing. There is no difficulty that cannot be overcome by patience and the spirit of sacrifice, through agreement between the goodwill of capital and the intelligence and ability of labour. The hardest moments are past and we can now look calmly to the future with confidence.

« Your minds will finally be cheered by the sight of our natural beauty spots : Naples and Capri will offer you the enchantment of their pure sky and the azure of their sea.

« You will visit Pompei, the Death City, which, returned once more to the light, still gives today a vision of the civilisation of some twenty centuries ago. May your journey be a happy one, and returning to your countries and to your work, may the remembrance of so many marvels of nature and of art make still dearer to you our beloved Italy, so often celebrated by your poets and artists. You will feel drawn nearer to us by a spirit of love and sympathy, which neither time nor space can diminish, and will make you see in us, not only collaborators, but friends and brothers.

« Gentlemen,

« With this wish which I express to you cordially and sincerely in the name of His Majesty the King, who desired by his august presence to render our meeting more impressive, I have the honour to declare the ninth session of your Congress open ». (*Prolonged applause.*)

Mr. TONDELIER, president of the Permanent Commission, replied in the following terms :

« Your Majesty,

« Allow me in the first place to respectfully salute Your Majesty who has been graciously pleased to attend the inaugural seance of the Railway Congress, and to express in the name of all my colleagues our profound gratitude for the special mark of interest Your Majesty has been good enough to show in our session and its work. We know how great is Your Majesty's appreciation of the immense value of railways in time of peace, how indisputable you consider them for the economical expansion of nations by facilitating the exchange of products of commerce and industry, but also how indispensable they are during the anxious times when it is necessary to defend one's native land.

« We offer to Your Majesty the respectful homage of our profound gratitude. (*Cries of « Vive le Roi! »*)

« Your Excellency,

« Gentlemen,

« When thirty-seven years ago Belgium celebrated the fiftieth anniversary of the inauguration of her first railways, she invited to a meeting at Brussels the Governments and the principal railway administrations, who were represented by their most distinguished specialists. The object was to discuss together a certain number of questions which were the subject of anxiety to the majority of those responsible for railway working, to note the methods which each railway had adopted to solve these and of the advantages which had been obtained and of the difficulties encountered. Nineteen Governments sent delegates and 131 systems, possessing 31 100 miles of track were represented.

« The success of this first Congress was so great, that the wish was expressed to hold scientific meetings of the same kind at regular intervals, and Mr. **Brame**, chief delegate of the French Government, proposed the creation at Brussels of a permanent centre for the organisation of these Congresses periodically.

« The adoption of these proposals was the means of creating the International Association of Railway Congresses, of which the definite rules were drawn up at the Congress which met two years later, in 1887, at Milan.

« Its development was rapid, at each of the sessions, at Paris in 1889, St. Petersburg in 1892, London in 1895, Paris in 1900, Washington in 1905, constant progress was reported, so much so, that at Berne in 1910, 48 Governments and 420 systems, with a length of track nearly fifteen times that of the circumference of the globe, were represented.

« The ninth session of the Congress should have taken place at Berlin in 1915; this however, of course, could not be held on account of the cataclysm which befell Europe and was felt even by the most distant countries of the globe. The invasion of Belgium on 4 August 1914 put an end to all the activities of the Association for nearly five years.

« As you know, Gentlemen, after the return of the Belgian Government, the Association was wound up in pursuance of the Belgian law of the 10 November 1918, because part of the assets belonged to subjects of the central empires and their allies. The sequestrator having ordained the dissolution and liquidation of the Society, the railway administrations, effective members of the Association belonging to thirty-five countries, decided to transfer their credit to an Association founded on exactly the same basis as the former one.

« The Executive Committee and the Permanent Commission, having received full powers for this, undertook their former functions, but it will be necessary for the ninth Congress to fix the Rules of the new Association.

« It is worthy of recording that it is on the hospitable soil of Italy that the latter will be definitely constituted, as was its predecessor at the Milan Congress. (*Applause.*)

« It was, Gentlemen, with sympathic promptness that the Italian Government threw open the doors of its capital for this Congress, a first manifestation of the vitality of our Association after the great crisis which shook Europe. Here we are re-united in this historical city, the cradle of Latin civilisation which projected and continues to project its resplendency over the world.

« When, during the intervals between our work, we go and look at the remains of Rome of 2 000 years ago, we shall feel dumbfounded in reflecting on the little hamlet of Palatine, whose history we see mounting step by step towards her colossal destiny. At first enclosed within

View of the Great Hall of the Palace of Exhibitions at R

ıg the Formal Opening of the Ninth Congress, on 18 April 1922.

the narrow confines of a marsh, she extended little by little, invaded the plain, ascended the mountains, triumphing over every obstacle, overcame every difficulty, even the most stubborn.

« Extending in every direction, Rome overstepped the sea, and becoming mistress of it, established successively her domination over all the Mediterranean coast; in Sicily and Spain, as in Africa, in Greece, as in Asia; then on the other side, crossing the barrier which to the North separates her from the rest of Europe, marking each of her steps even in our countries by gigantic undertakings she went on to sow the germs of a new civilisation destined to outdistance by far those that had preceded it.

« And when we engineers find ourselves near her palaces, her triumphal arches, her arenas, her theatres and her circuses, the remains of her roads, bridges, baths, aqueducts and water systems, all of which are objects of our daily occupations, we shall no longer be surprised that Rome has bequeathed to the ideals, to the laws, to the civilisations, and to the languages of the races which survive her, traces which the remotest posterity will never efface.

« It is in this city, full of glorious reminders of the past, that you were kind enough, Your Excellency, to open the ninth session of the Railway Congress, and where you have welcomed us in such lofty and cordial terms.

« The Permanent International Commission offers to you, Your Excellency, its sincere gratitude. It also very sincerely thanks the members of the Italian temporary Commission, who have so whole heartedly co-operated in the preparations for our session. (*Applause.*)

« The questions submitted to the Congress are 20 in number, divided as usual into five sections : Way and Works, Locomotives and Rolling Stock, Working (operation), General, Light Railways.

« Amongst the principal ones may be mentioned :

« Construction of the roadbed and of the track;

« Special steels;

« Reinforced concrete;

« Bogies (trucks), axles and springs of locomotives;

« Passenger carriages;

« Electric traction;

« Terminal passenger stations;

« Goods (freight) stations;

« Slow (freight) traffic;

« Net cost. Rates;

« Operation of light railways;

« Safety appliances on light railways.

« The study of most of the questions was given to several reporters, who had to examine the replies received from certain definite countries. In order to facilitate the discussions in the sections, and by way of an innovation, one special reporter was designated to sum up the different reports relating to one and the same question. The reporters, chosen from amongst the best known specialists of the branch in which each question belongs, got together a mass of valuable information which already allows us to state that the Rome session will add considerably to the solution of numerous problems in connection with the working of railways.

« In the name of the Permanent Commission, I thank the reporters for the able and consciencious work they have been good enough to undertake.

« When account is taken of the universal rise of prices in the markets of the world, it is easy to foresee what a hearty welcome will be given by all railway administrations to every solution capable of reducing, either directly or indirectly, working expenses, assuring at the same time the security and regularity of the train services.

« Since our meeting at Berne in 1910, we have suffered the sad loss of our president, Mr. Dubois, who during twenty years filled the office of president of the Permanent Commission. As predecessors in his duties, Mr. Dubois had Mr. Fassiaux, who has often been called the apostle of the Congress, and Mr. Belpaire, the eminent engineer who acquired such a well justified reputation in the world of railway workers. Mr. Dubois, whose simplicity and affability, tact and broad mindedness, you were able to appreciate, will leave an imperishable memory in our annals. Under his presidency, our Association passed through the most brilliant period of its existence. In striving to maintain it in the future at the same level and in developing as far as possible the work that he loved so much, we shall all render to his venerated memory the homage that one thinks would most fully follow his wish.

« To these names I must associate that of our former general secretary, Mr. Weissenbruch, who from the origin of our Association in 1885 took a most active part in its work. Endowed with consummate activity and of remarkable initiative, he rendered the most signal services to the Permanent Commission. Applying his great faculties of organisation, he was actively engaged in the preparation of the Rome Congress, when, on 7 August last, death came to claim him. We shall keep a touching and grateful remembrance of him.

« I will still further associate with these names which are dear to us those of Messrs. Alfred Picard and Weissenbach, who respectively presided so brilliantly and with so much authority at the sessions of Paris in 1900 and Berne in 1910, and who contributed in such great measure to the remarkable results of these two meetings. I will call to your mind that Mr. Alfred Picard took a very active part in the choice of the questions which are going to be the object of our deliberations.

« If we salute with emotion the memory of these men, who consecrated a great part of their effort to the work that we come here to continue, let us promise ourselves to be their worthy successors, and let us strive, Gentlemen, to make the Rome Congress as eminent as its predecessors, and that in its turn it may bring an important contribution to the cause of progress and of civilisation. » (*Prolonged applause.*)

The Minister then declared the ninth session of the Congress to be open, amidst the cheers of the whole assembly and took his departure.

Mr. Tondelier, president, proposed to the assembly that the Minister of public works of the Italian Government should be acclaimed honorary president, and Messrs. Bianchi and de Cornè, honorary vice-presidents (*Applause.*)

He also proposed that Mr. Crova, director general of the Italian State Railways be acting president (*Agreed*).

Mr. Crova then took the chair as president and delivered the following address :

« Gentlemen,

« In accepting the great honour you have done me by calling on me to occupy this position, I feel deeply moved by two sentiments : profound gratitude for the kindness which you have shown me, and anxiety lest I should not rise to the height of an office, which in the preceding sessions has been entrusted to the most eminent members of the Congress. I have, however, accepted it with great deference, and shall exert myself to fill the position as well as I can, because I know that I owe my nomination exclusively to a manifestation of homage and sympathy for my country, which is proud to receive you. (*Applause.*)

« As His Excellency, the Minister of public works has already welcomed you in the name of the Government, I will do the same in the name of the Italian State Railways, who honour you as the most illustrious representatives of modern technical transport.

« It is in fact you, Gentlemen, that technical transport has to thank and to your efforts in the past that it can today exclaim those fateful words : *Quo non ascendam?* It is to you that it owes that magnificent progress which has secured the regular and uninterrupted movement of traffic which is as necessary to the life and strength of our civilisation as the circulation of blood is to the life and strength of our bodies. (*Applause.*)

« In his speech, His Excellency the Minister has explained to you the present situation of our railways. It should be noted the Italian system is the most extensive of the State Railways of Europe. Will you allow me to briefly illustrate the work of my administration from 1905, when it was formed by taking over the old companies, until the end of the year 1921. This will allow you to appreciate the efforts we are making to improve our railways and bring them up to the standard of nations who have been better equipped with railways than ourselves. I feel it an honour to be connected with this work, and this honour I share with my illustrious predecessors, Senator Bianchi and engineer de Corné, the two honorary vice-presidents of our Congress. (*Applause.*)

« You know how, in 1905, the Italian State took over the working of the greater part of its lines, namely, those which until that time had been worked by the Mediterranean, Adriatic and Sicilian Companies. The beginning of the new regime was not without inevitable difficulties; nothwithstanding that the old working arrangements were supposed to be identical, there existed in the respective organisations of the three companies certain differences of systems which rendered difficult the constitution of a single administration organised on a new basis, with a personnel drawn from three different administrations. Little by little however, patiently and prudently, the fusion was achieved and we were able to ensure regularity of service.

« Between 1906 and 1920 the State absorbed almost all the remaining railways worked by private enterprise, a total of about 2 165 miles. I will only mention the most important, that is the Southern line, worked until 1906 by the Adriatic Company (1 380 miles), the Palermo-Trapani (121 miles), Primolano-Mestre (50 miles), Rome-Viterbo (54 miles), the Royal Sardinia Railways (263 miles), etc.

« As these railways were added to the State line, the Administration found itself confronted with the task of co-ordinating the services, and in order to obtain rapid results and satisfy the populations affected, a heavy expenditure was necessary.

« The financial burdens which we undertook for the progressive organisation of our lines is shown by the following figures which refer to the period July 1905 to December 1921 :

« *a*) For construction of new lines : expenditure 736 817 890 l. 65;

« *b*) For work and expenses on plant on a permanent character, rolling stock and store included 2 826 575 145 l. 64.

« During the year 1920-21, the expenditure for fuel reached the figures of 1 128 180 446 l.; maintenance of the lines 79 131 234 l.; personnel 2 193 millions 477 009 l.

« The last named sum may perhaps cause surprise, but it is owing in part to the consequences of the war; in part to the application of the law for an eight hour day, and finally to the numerous increases of wages and to the extra grants conceded in order to meet the increased cost of living.

« Naturally, these extra costs have had a considerable influence on the working expenses; one of our greatest anxieties has been to gradually reduce such expenses in order to limit the inevitable deficit which has appeared in our balance sheet, and to render possible reductions in fares and rates, after the increases which unfortunately have followed the increase in the expenses.

« As regards the construction of new lines, since 1905 the State lines have been increased by about 311 miles. We are proceeding with the greatest possible speed, compatible with after-war difficulties, with another 497 miles, of which 435 miles are ordinary gauge railways. Among these are included the express routes Florence-Bologna and Genoa-Arquata, both of which cross the Apennines, the first with a tunnel of 11 1/2 miles, the second with another tunnel of nearly 10 miles; besides the express route between Rome-Naples, the work of which is already so far advanced, that we have been able to utilise for some time a track of over 20 miles. This last line also includes important engineering works and many tunnels, two of which are from 4 to 5 miles long.

« These new arteries, of the highest importance to our traffic and destined to a great future, were designed with the greatest care, with almost imperceptible gradients, ample curves, double track and an almost total absence of level crossings.

Every technical difficulty was brilliantly overcome.

« A total of 702 miles of standard gauge railway lines are contemplated. Finally, the Government has employed various special commissions to study a vast design for a complete continental and insular railway system, which, if adequately carried out, would largely meet our needs.

« Official statistics prove the progress which we have achieved in the matter of our rolling stock. Locomotives, which in 1905 numbered 3 079, have increased in 1921 to 5 780, and in addition over 73 steam vehicles, to which should be added about 500 locomotives belonging to the newly annexed provinces. As regards electric traction, we have in service 244 locomotives and 51 motor cars. Passenger and railway carriages have increased from 7 008 to 11 389; postal carriages from 1 752 to 4 696; wagons from 52 324 to 157 374.

« Our locomotive depots, into which we have introduced and are introducing all modern technical improvements, now number 95. The machinery alone has cost over 16 million lire.

« Locomotive workshops are so far 10 in number; two others will shortly be built.

« We have faced two problems with satisfactory results : 1° the use of liquid fuel for our locomotives, but the adoption of this system has had to be postponed in consequence of the high price of fuel in the international market; 2° the purification of the water which feeds the boilers, a problem of great importance in economy in working. This problem was completely solved, and we have today 28 purifiers which furnish us altogether with more than 565 000 cubic feet of water daily.

« Fifteen State mechanical workshops are charged with the maintenance and repairs of the carriages and wagons. Their total area is 1 035 500 square yards, of which 303 900 are roofed. These workshops are able to repair annually a total of 3 000 carriages, 3 000 luggage vans, and 19 500 wagons. Some of these are in course of construction according to the most perfect and accepted methods. These establishments not being sufficient for our requirements, we make use of at least 30 private firms.

« 93 auxiliary shops look after light repairs, and they can deal with about 2 000 vehicles daily. The cleaning and disinfection of carriages is also entrusted to them, which is done according to the most strict and modern rules of sanitary science.

« The problem of electric traction has been the object of our special care and most profound study. After the experiments on the Milan-Sondrio-Tirano lines (Adriatic line) and Milan-Varese (Mediterranean line) the first worked by an overhead wire at a tension of 3 000 volts, and the second by a third rail, experiments which were made by the late railway companies, the Administration of the State Railway decided to definitely adopt the system of overhead wires even on the steepest gradients. They began with the two lines of the Giovi (3 1/2 %) which had become insufficient to carry the enormous traffic of the Port of Genoa.

« The benefits obtained by this first application suggested the study of a vaster problem of electrification. The difficulties of the war obliged us to delay the work already commenced, but it was not entirely abandoned, even at that time we had in normal service, besides the above mentioned lines, those of Bussoleno-Bardonecchia, Savona-Saint Joseph, and Monza-Lecco (all working before the war), and in addition two others, Sampierdarena-Savona and Turin-Pinerolo.

« When hostilities ceased, the trials were vigorously renewed; a large scheme of accurately organised work allows me to say with certainty that six or seven years hence it will be possible to work by electricity about 3 107 miles of heavy traffic lines in our country; a considerable economy of fuel will be achieved, gradually falling to two-thirds of the present expense. Today the lines Bologna-Florence, Faënza-Bologna, Genoa-Pisa, Rome-Tivoli, Rome-Anzio-Nettuno, are being electrified. The work on the Ronco-Trofarello line has been recently completed, so that it will be possible for you to visit the whole of the route from Genoa to Modane, and to travel over it in an electric train. You will also be able to realise the power of our waterfalls and alpine torrents, and to see the perfect organisation of our hydro-electric works.

« Gentlemen,

« I have summed up in these few figures what my country has carried out in less than twenty years in order to make her lines efficient and to intensify her system of transport. Much remains still to be done; the great tragedy of the war lasted five years, obstructed every endeavour, but our activity was not interrupted or diminished. Today we must regain lost time, we must call upon all our courage and all our perseverance.

« Your discussions and your deliberations will be most valuable to us, they will facilitate our task, if, as I hope, you reach a perfect agreement among the administrations represented here, an agreement which must be founded on the basis of a complete equality of treatment, combined with common effort.

« I have the honour to propose a vote of thanks and congratulation to the Permanent Commission, and especially to its illustrious president, Mr. TONDELIER, who has organised our session with so much zeal. I invite you finally to begin your task, congratulating myself that they will leave some days for recreation and allow of your visiting our country so that you may carry away from it a pleasant memory.

« Above all do not forget to observe and get to know the Italian people, this frank, hardworking, noble and generous people who are preparing to receive you worthily. (*Applause.*)

« Return to your homes and spread around you the sentiment of esteem and friendship which your heart will have conceived for our nation. You will thus worthily crown your work for peace and civilisation. (*Applause.*)

« I have the honour to request the chief delegates of the different Governments, and the vice-presidents, to take their seats on the platform.

« I believe that I express the wishes of the assembly in requesting Mr. VERDEYEN, the interim general secretary of the Permanent Commission, to keep the position held by him provisionally, and propose as joint general secretaries with him, Mr. FRANZA, chief secretary of the Local Organising Commission and Sir Henry FOWLER, chief mechanical engineer, Midland Railway (England), and as Assistant General Secretary, Mr. GIOVENE, second secretary of the Local Organising Commission. » (*Carried unanimously.*)

The general secretary, Mr. VERDEYEN, then offered thanks in the following terms :

« Mr. President,

« Gentlemen,

« I thank you very heartily for the honour of entrusting me with the duties of General Secretary of the ninth Congress of the International Railway Association.

« Having before me the great example of my eminent predecessor, the late general secretary Louis WEISSENBRUCH, I promise you to devote my whole activity and zeal to the success of this session.

« With the co-operation of such distinguished and competent men as Mr. FRANZA, Sir HENRY FOWLER and Mr. GIOVENE, I have no doubt that we shall be able to do our work to the satisfaction of all the members of the Congress. » (*Applause.*)

Mr. TONDELIER then rose and said :

« Gentlemen,

« A few months ago, on the day of the third anniversary of the victory of Vittorio Veneto, Italy brought into her metropolis the mortal remains of an unknown soldier.

« From its starting point, North of the Adriatic Sea from Aquilea to Rome, the train that carried the remains went past amidst the emotion and enthusiasm of the people.

« At Rome, Italy made his tomb at the foot of the statute of the first of her kings, the founder of Italian unity.

« The Executive Committee thought well to respond to the wish of all in deciding that at our first meeting a wreath should be put on the tomb of this hero as an act of homage to the army to which he belonged and to the nation that are offering us their hospitality.

« As soon as the sitting is terminated, we shall form a procession to the memorial; no speech will be delivered. We have considered that a moment of silent meditation will be as impressive as the finest words ». (*Carried unanimously.*)

⁂

THE PRESIDENT then invited the members to attend the sectional meetings on the following morning.

The Permanent Commission had chosen as provisional presidents of the sections the following of its members:

Mr. MAURIS for the 1st section;

Mr. ALESSANDRI for the 2nd section;

Mr. COLSON for the 3rd section;

Sir EVELYN CECIL for the 4th section;

Mr. ERNEST GERARD for the 5th section.

— The proceedings terminated at 5.0 p. m. amidst general enthusiasm.

— The members of the Congress, accompanied by ladies, went to the Piazza Veneto in order to pay homage to the Italian heroes of the Great War by putting on the tomb of the unknown soldier a beautiful wreath adorned with a ribbon of the Belgian colours, the Association having its headquarters at Brussels.

# GENERAL OFFICIALS OF THE SESSION

### ***Honorary President :***

Mr. Riccio, Minister of Public Works of Italy.

### ***Honorary vice-presidents :***

R. Bianchi, ingénieur, sénateur du royaume d'Italie.

R. de Corné, ingénieur, président du conseil supérieur des travaux publics d'Italie (member of the Permanent Commission of the Association).

### ***President :***

C. Crova, ingénieur, directeur général des chemins de fer de l'Etat italien (member of the Permanent Commission of the Association).

### ***Vice-presidents :***

*Belgique* (*Belgium*). — V. Tondelier, administrateur-président honoraire, membre du conseil d'administration des chemins de fer de l'Etat (president of the Permanent Commission of the Association).

*Brésil* (*Brazil*). — J. L. Baptista, ingénieur, sous-directeur du chemin de fer Central du Brésil.

*Chili.* — R. del Rio, ingénieur.

*Chine* (*China*). — Tsang Ou, directeur général adjoint du chemin de fer du Lunghai.

*Danemark* (*Denmark*). — T. A. Alstrup, directeur général des chemins de fer de l'Etat (member of the Permanent Commission of the Association).

*République Dominicaine* (*Republic of Dominica*). — Sechino, consul général à Gênes.

*Egypte* (*Egypt*). — J. Maudsley, sous-directeur général des chemins de fer de l'Etat.

*Equateur* (*Ecuador*). — P. P. Guzman, ingénieur civil.

*Espagne* (*Spain*). — V. Salinas, inspecteur général des ponts et chaussées.

*Etats-Unis d'Amérique* (*United States of America*). — W. F. Schleiter, Department of State.

*France et colonies* (*France and Colonies*) :

A. *France.* — C. Colson, membre de l'Institut, président de section du conseil d'Etat, inspecteur général des ponts et chaussées (vice-president of the Permanent Commission of the Association).

B. *Colonies.* — *Tunisie* (*Tunis*). — Favière, ingénieur des ponts et chaussées, directeur général adjoint des travaux publics.

*Grande-Bretagne, Empire des Indes et colonies* (*Great Britain, India and Colonies*) :

A. *Grande-Bretagne* (*Great Britain*). — Colonel J. W. Pringle, C. B., chief inspecting officer of railways.

B. *Empire des Indes et colonies* (*India and Colonies*). — *Indes* (*India*). — G. Deuchars, government director of Indian railway companies.

*Colonie de Nigéria* (*Colony of Nigeria*). — F. H. Greenhough, deputy general manager, Nigerian railway.

*Grèce* (*Greece*). — G. Bouyoukas, inspecteur des chemins de fer de l'Etat.

*Italie* (*Italy*). — A. Ciappi, professeur, ingénieur, député au Parlement.

*Japon* (*Japan*). — Dr. M. Nawa, engineer.

*Luxembourg* (*Luxemburg*). — A. Lefort, premier commissaire du gouvernement pour les chemins de fer.

*Mexique* (*Mexico*). — A. **Barocio**, ingénieur.

*Norvège* (*Norway*). — C. T. **Holtfodt**, directeur général de l'administration des chemins de fer de l'Etat.

*Paraguay*. — V. **Coppin**, consul général à Naples.

*Pays-Bas* (*Holland*). — L. M. **Barnet Lyon**, ingénieur civil, membre du Conseil de surveillance des chemins de fer.

*Pologne* (*Poland*). — M. **Loret**, conseiller de légation.

*Portugal*. — A. J. **Dantas**, ingénieur, directeur général des chemins de fer.

*Siam*. — G. **Canova**, chef du service technique des chemins de fer de l'Etat.

*Suède* (*Sweden*). — J. **Flodin**, directeur en chef des chemins de fer de l'Etat.

*Suisse* (*Switzerland*). — A. **Schrafl**, directeur général des chemins de fer fédéraux.

*Tchéco-Slovaquie* (*Czecho-Slovakia*). — K. **Juranek**, ingénieur, directeur du département V-4.

### *General secretaries :*

J. **Verdeyen**, ingénieur en chef, inspecteur de direction aux chemins de fer de l'Etat belge (general Secretary of the Permanent Commission).

E. **Franza**, avocat, chef de service aux chemins de fer de l'Etat italien.

Sir Henry **Fowler**, chief mechanical engineer, Midland Railway.

### *Assistant general secretary :*

N. **Giovene**, ingénieur, inspecteur principal aux chemins de fer de l'Etat italien.

## OFFICIALS OF THE SECTIONS

### SECTION I. — Way and works.

| | |
|---|---|
| *President :* | F. BRUNEEL, administrateur-président des chemins de fer de l'État belge (member of the Permanent Commission). |
| *Vice-presidents :* | **Barrand**, inspecteur général des ponts et chaussées, directeur du contrôle de la voie et des bâtiments au Ministère des travaux publics de France;<br>H. **Deyl**, ingénieur, conseiller supérieur des chemins de fer de l'État tchéco-slovaque. |
| *Principal secretary :* | G. **Tronconi**, ingénieur, inspecteur principal au service des travaux des chemins de fer de l'État italien. |

*Secretaries :*

C. **Jullien**, ingénieur en chef de la voie et des travaux à la Compagnie du chemin de fer d'Orléans;

L. **Ballino**, ingénieur en chef du service central de la voie de la Compagnie du chemin de fer d'Orléans;

J. **Viallefond**, ingénieur en chef adjoint de la voie de la Compagnie des chemins de fer de Paris à Lyon et à la Méditerranée;

L. **Depoorter**, ingénieur principal au service des voies et travaux des chemins de fer de l'État belge.

## SECTION II. — Locomotives and rolling stock

*President :* G. GIBBS, chief engineer of electric traction, Long Island Railroad.

*Vice-presidents :* P. Paul-Dubois, sous-directeur de la Compagnie du chemin de fer d'Orléans;

J. Van Loenen Martinet, ingénieur pour la construction des lignes électriques des chemins de fer néerlandais;

A. Floor, directeur, chef du département des machines et de la traction des chemins de fer de l'État danois.

*Principal secretary :* F. Stalder, ingénieur adjoint à l'inspecteur de la section mécanique du département fédéral des postes et des chemins de fer (Suisse).

*Secretaries :*

H. Parodi, ingénieur en chef des services électriques de la Compagnie du chemin de fer d'Orléans;

P. Pasquier, ingénieur, sous-directeur à la Compagnie générale de chemins de fer en Chine;

E. Minsart, ingénieur principal à la direction de la traction et du matériel, secrétaire du cabinet du ministre des chemins de fer de l'État belge;

M. de Paiva Couceiro, ingénieur adjoint à l'ingénieur en chef du matériel et de la traction de la Compagnie des chemins de fer portugais;

E. Uytborck, ingénieur honoraire à l'Office de l'électricité des chemins de fer de l'État belge.

## SECTION III. — Working.

*President :* G. BEHRENS, Director, Midland Railway (member of the Permanent Commission).

*Vice-presidents :* The Right Hon. Sir E. Cecil, G. B. E., M. P., privy Councillor, director London & South Western Railway (member of the Permanent Commission);

C. Hanrez, administrateur des chemins de fer de l'État belge (member of the Permanent Commission).

H. Van Manen, membre de la direction des chemins de fer néerlandais.

*Principal secretary :* M. Bonnevay, ingénieur principal de l'exploitation des chemins de fer algériens de la Compagnie Paris-Lyon-Méditerranée.

*Secretaries :*

O. Henry-Gréard, chef de l'exploitation de la Compagnie du chemin de fer d'Orléans;

U. Lamalle, ingénieur en chef, directeur d'administration aux chemins de fer de l'État belge;

F. Fiori, ingénieur, inspecteur supérieur des chemins de fer de l'État italien;

C. Epinay, sous-chef de l'exploitation à la Compagnie du chemin de fer d'Orléans;

H. Waters, Continental representative at Paris of the London & North Western Railway.

## SECTION IV. — General.

*President :* J. PAUL, directeur de la Compagnie des chemins de fer du Midi (France).

*Vice-presidents :* W. Atterbury, vice-president in charge of operation Pennsylvania Railroad (member of the Permanent Commission);

A. Dejean, directeur des chemins de fer de l'État français;

J. de Oliveira Simôes, ingénieur, directeur général du commerce et de l'industrie (Portugal);

H. Van der Minne, ingénieur civil, membre du Conseil de surveillance des chemins de fer au Ministère du Waterstaat (Pays-Bas).

*Principal secretary :* Baron C. Krayenhoff, chef de division des chemins de fer néerlandais.

*Secretaries :*

P. Chavegrin, docteur en droit, rédacteur principal au service du contentieux de la Compagnie des chemins de fer de Paris à Lyon et à la Méditerranée;

F. Engel, attached to the general manager's department of the London & North Western Railway;

C. Grillo, agent general for Italy of the South Eastern and Chatham Railway;

O. Viglione, ingénieur, sous-chef au service des affaires générales des chemins de fer de l'État italien;

P. Zutter, secrétaire adjoint du 1er arrondissement des chemins de fer fédéraux suisses.

## SECTION V. — Light railways.

*President :* F. TAJANI, ingénieur, président de la Fédération des transports d'Italie (member of the Permanent Commission and vice-president of the Italian section).

*Vice-presidents :* H. Caufriez, directeur général de la Société nationale belge des chemins de fer vicinaux;

R. Peironcely, directeur-adjoint de la Compagnie des chemins de fer de Madrid à Saragosse et à Alicante.

*Principal secretary :* F. Level, directeur de la Compagnie générale de voies ferrées d'intérêt local (France).

*Secretaries :*

F. Heaven, Accountant, Bombay, Baroda & Central India Railway;

G. Mayer, attached to the Great Eastern Railway;

A. Natoli, vice-président délégué de la Société sicilienne des travaux publics (Italie);

A. Pasini, ingénieur à la Fédération des transports d'Italie;

G. Vallecchi, ingénieur à la Fédération des transports d'Italie;

F. Vezzani, ingénieur à la Fédération des transports d'Italie.

# BANQUET OFFERED BY THE ITALIAN GOVERNMENT

On the 19 April 1922 at eight o'clock in the evening, a large banquet, given by the Italian Government to the members of the Congress, took place at the *Therme Diocleziane.*

The rooms of the magnificent old building had been wonderfully arranged for the occasion, with lovely floral decorations and special electric lighting. Twelve hundred guests were seated at forty tables placed at right angles to the « table d'honneur ».

The banquet was presided over by His Excellency the Minister Riccio, at his right being Mr. Tondelier, president of the permanent Commission, and at his left, Mr. Crova, president of the session.

A military band played during the banquet national anthems of the countries represented; these were received with loud applause.

The following speeches were delivered :

### Speech by His Excellency Minister RICCIO.

Ladies and Gentlemen,

You will understand my emotion as I speak to such a sympathetic gathering, and in such a place.

This very year, it is just a hundred years since the opening and working of the first railway: it was very short, measuring less than 10 miles and started from the Hetton Colliery. It then seemed a most audacious attempt. A century has passed, and the whole world is covered with these ribbands of iron which bring civilisation in their track.

The locomotive has met no difficulty that it has not surmounted. It reaches the summit of the highest and steepest mountain, it bores through the very bowels of the earth and surmounts obstacles which at first seemed to be unsurmountable. Bringing civilisation everywhere, it has even created cities and draws together people of all races, colour and habits. We desire to salute such human genius and such human work here within these ancient walls which have resisted so well the destructive work of time. They were raised by a dominant race, who after having conquered the whole known world, rested on their victories, believing that they would last for all time.

Today, however, we find here the representatives of the free peoples of the world drawn together by their desire for peace and progress,

« ... égaux dans la vaillance »,

as sang Béranger, who desire to celebrate the victories of human progress and the work of mankind.

The Italian Government through me salutes these peoples which you so nobly represent; they salute the Sovereigns and the Heads of States (of whom you are the delegates) and our affectionate and grateful thoughts go out to them. But our first and most respectful homage is directed to our August Sovereign — great in gifts of mind and heart — to our King — who yesterday deigned to be among us to give to you his inaugural welcome — to Victor Emmanuel III — a model to all as King, as soldier, as citizen. (*Applause.*)

Ladies and Gentlemen,

Long live the King of Italy! (*Cheers.*)

### Speech of Mr. TONDELIER.

Ladies and Gentlemen,

It is only twenty-four hours since, in the presence of His Majesty the King, His Excellency the Minister of Public Works, welcomed

View of the « Therme Diocleziane », at which the official banquet offered to the members of the Congress by the Italian Government on the 19 April 1922, took place.

us at the inauguration meeting of our Congress, and we now meet at this banquet to which the Italian Government has so kindly and generously invited us.

This kindness is no surprise to those of us who know your country, and who already have appreciated the cordiality of your welcome as well as the magnificence and warmth of your reception.

Doubtless you will agree with me that if the reports read before and discussed by the Congress are of value, what is of even greater value is the opportunity that the representatives of the various nations have of meeting and becoming acquainted with one another. The advantage of this cannot be overestimated and should give substantial results. (*Applause.*)

We have come here from all quarters of the earth. In the railway world the Italian engineer has had to deal with difficulties as great as any which are met with in any part of the earth. Not only has he had to fight against the difficulties of the mountains, but he has also solved in a most satisfactory way the troubles which are due to the marshes. Has he not under the difficult conditions built those works of art which are the admiration of the world? Has he not distinguished himself in every department of transportation? As we so well know, the Italian engineer has taken the initiative in electric traction. Twenty years ago, he had solved the problem of drawing long trains over heavy lines by electric traction.

Is one surprised that so many are attending the Congress here at Rome in order to have the opportunity of visiting and investigating works which are the result of so much energy, science and ingenuity? (*Applause.*)

Ladies and Gentlemen, is not Italy the magnet which attracts, from all over the world, all artists and thinking men in order that they may study, in an ideal atmosphere, art in the highest sense? (*Loud applause.*)

Ladies and Gentlemen,

I raise my glass to Italy great and noble, still living in the heroism which has characterised it throughout the ages; I drink to the health of His Excellency the Minister of Public Works who has honoured us with his presence. (*Applause.*)

### Speech by Mr. COLSON,
### Vice-president of the permanent Commission.

Your Excellency, Ladies and Gentlemen,

Our Association is in fact international, but its founders desired that it should be by law Belgian, that the President, and the Vice-President, who in case of necessity would substitute him, should be Belgians in order to ensure in this work the certainty of perpetual neutrality. This certainty was enjoyed until the day in which it was violated by some who were among those who had most solemnly guaranteed it.

Beyond this, precedent ordains that a second Vice-President should be elected from among the other countries which belong to our Association, and in this post my colleagues have placed me. Owing to this, I have the honour of joining my voice, to that of Mr. Tondelier, in thanking the Italian Government, in the name of all the foreigners who have come from all parts of the world, for the magnificent reception which has been given to us here in the Capital of Italy. (*Applause.*)

What Capital could be more suitable than Rome for the meeting of an Assembly which includes experts and administrators belonging to all nations and whose aim is to study the works of Peace and Civilisation after the tumult of arms and after the voluntary devastation which took place during, and more especially towards the end of the war. Is it not Rome, in fact, which after receiving from Greece the torch of Mediterranean civilisation, and after extending the field that that torch lighted gave to that greater world the « Roman peace » and established those laws which are the basis of all modern laws? (*Applause.*)

Again, when the invasion of the barbarians had killed that ancient civilisation and when was substituted for it what Renan has called « the interruption of a thousand years in the progress of human thought », when all nations were split up into small feudal principalities, was it not once again Rome who put herself at the head of the only surviving element of progress and peace, becoming the Capital of that new form of union between peoples, which was Christianity.

Moreover, a third time, just when the Reformation upset that religious Unity, Italy became once more the centre and the home of the re-quickening of thought, and of the uplift in Art and Science, to which history has given the name of the Renaissance, and which has rendered so many of your cities illustrious.

Today the civilised world, which embraces the entire globe, has developed too enormously for any one nation to claim to direct it; modern contemporary history has shown us the catastrophies which follow all attempts at hegemony. If the Roman peace is to reappear among the crowd of independent peoples, it can only be by means of the regular working of a League of Nations broadly constituted and furnished with tribunals and means of action sufficiently strong to assure the respect of right and for the execution of treaties. (*Applause.*)

But while we wait for this new regime to come into being side by side with international organs set up by governments, numerous free associations like ours ensure the collaboration of the workers in various branches of human activity. In all these branches, Italy has gained a place worthy of her glorious past. After having re-established her unity, destroyed for so many centuries, after having definitely completed it by taking her place among those who fought for the right in the late struggles, she has shown in science and literature, in agriculture and industry, that she knows how to keep herself among the first of the free nations in a world which no longer tolerates masters. (*Applause.*)

Since we are here among railwaymen, and I am French, may I be permitted to recall that the first great tunnel which broke down the barriers erected between mankind by high chains of mountains, was a French-Italian work which united the two Latin sisters through the Mont Cenis. Even thus I hope and desire that the first great tunnel uniting two peoples separated by the sea, will be that which, passing under the Channel, will unite us to England, our great friend. (*Applause.*)

We shall find here interesting examples of the work of our profession which is only a century old, whilst at the same time we can study and admire the wonderful remains which have survived so many centuries, and also the survival of that Latin culture which in a world essentially democratic is recognised as the aristocracy of education. Therefore I raise my glass to salute with a sense of fraternity, the great Italian nation, and with filial respect the Capital, so ancient and so modern, the Eternal City. (*Prolonged applause.*)

### Speech by Mr. CROVA.

May I be allowed to express in a few short words the thanks of the Italian State Railways to His Excellency the Minister of Public Works for the extreme courtesy with which he has received the members of this Congress at this pleasant banquet in such a noble and majestic site.

Yesterday His Majesty the King honoured us with his august presence. Today it is the Government which shows keen interest in our work. This is a much desired reward for those who have worked to prepare this Festival of Science and Industry.

The International Railway Association will certainly mark the Congress of Rome with a « albolapillo » in its annals.

Thanks also to you, beloved colleagues, who have come from all parts of the world to render homage to Italy in the highest manifestation of her progress. (*Applause.*)

We shall take advantage of your illuminating counsels, and of the potent help of your experience; we shall value not only praise, but also benevolent criticism.

Permit me, a modest railwayman, to propose a toast: I drink to the health of the great railway family, to its noble traditions, to its triumphal progress through the centuries for peace and the brotherhood of the peoples, for the cause of civilisation. (*Applause.*)

### Speech of the Rt. Hon. SIR EVELYN CECIL, Member of the Executive Committee

(Speaking in French.)

I should like to say a few words to express my best thanks, on behalf of the railways of Great Britain, to the Italian Government for the hospitality, so splendid and so unique in this historic building, with which they have entertained us this evening. We appreciate immensely all that they have done for us. We have advanced side by side during the war, and we desire — we allies, France, Belgium, Great Britain, and all of us, and the Americans too — to come together in time of peace as in war to help in some degree world-wide improvement while achieving new inventions or new successes in the railway world. I know well what great capacity Italy has for assisting, for I visited the Italian front in 1917, on the Trentino and also on the Carso, and I saw the superb efforts which she made amid stupendous difficulties, and I admired them from the bottom of my heart and shall never forget them. And now again we march together — and ought to march together — in peace as we did to victory; and all the railways of all the countries of our Association can join together in common friendship, through the means of the Association, to attain not only the goal of technical excellence, but also that of restoration of prosperity everywhere, by means of mutual friendship between them and between their delegates, in the quiet and restfulness spirit of our sessions. I again thank the Italian Government from the bottom of my heart. (*Loud applause.*)

The speeches of His Excellency the Minister Riccio, of Messrs. Tondelier, Crova, Colson and Sir Evelyn Cecil, were enthusiastically cheered by the guests.

Everyone enjoyed very much this memorable and unique feast, and the organisers, amongst whom may be mentioned, Messrs. Comm. Ing. GIUSEPPE PIETRI, Cav. Off. Ing. PRANDONI, Cav. Ing. LA GUARDIA, Cav. Ing. NESTORE GIOVENE, Cav. EGISTO PAOLI, deserve the heartiest congratulations.

## Programme of

| — | | SECTION I.<br>—<br>WAY AND WORKS. | SECTION II.<br>—<br>LOCOMOTIVES AND ROLLING ST |
|---|---|---|---|
| Wednesday 19 April. | *Morning* . . . | Installation of the section and fixing the programme of procedure.<br>—<br>I. Construction of the road-bed and of the track. | Installation of the section and fi the programme of procedure.<br>—<br>VI. Bogies [trucks], axles and s of locomotives. |
| | *Afternoon* . . | I. Construction of the road-bed and of the track. (*Continued.*) | VI. Bogies [trucks], axles and s of locomotives. (*Continue* |
| Thursday 20 April . | *Morning* . . . | II. Maintenance and supervision of the track. | VI. Bogies [trucks], axles and s of locomotives. (*Continue end.*)<br>VIII. Electric traction. |
| | *Afternoon* . . | . . . | . . . |
| Friday 21 April . . | *Morning* . . . | III. Special steels. | VIII. Electric traction. (*Continue* |
| | *Afternoon* . . | . . . | . . . |
| Monday 24 April . . | *Morning* . . . | I. Construction of the road-bed and of the track. (*Continued and end.*)<br>III. Special steels. (*Continued and end.*) | VIII. Electric traction. (*Continu end.*)<br>V. Economic production and steam on locomotives. |
| | *Afternoon* . . | . . . | V. Economic production and steam on locomotives. *tinued.*) |
| Tuesday 25 April . . | *Morning* . . . | II. Maintenance and supervision of the track. (*Continued and end.*)<br>IV. Reinforced concrete. | V. Economic production and steam on locomotives. *tinued and end.*)<br>VII. Passenger carriages. |
| | *Afternoon* . . | IV. Reinforced concrete. (*Continued.*) | VII. Passenger carriages. (*Conti* |
| Wednesday 26 April. | *Morning* . . . | IV. Reinforced concrete. (*Continued and end.*) | . . . |
| | *Afternoon* . . | General meeting. | General meeting. |
| Thursday 27 April . | *Morning* . . | . . | VII. Passenger carriages. (*Con and end.*)<br>Motion of Sir Henry Fow Utility of studying the q of the use of liquid fuel i motives.<br>XII. Locomotive cab signals. *tinued and end.*) *With section III.* |
| | *Afternoon* . . | General meeting. | General meeting. |
| Friday 28 April, *Morning*. . . . . . | | General meeting and closing ceremony. | General meeting and closing cere |

# ional meetings.

| SECTION III.<br>WORKING. | SECTION IV.<br>GENERAL. | SECTION V.<br>LIGHT RAILWAYS. |
|---|---|---|
| nstallation of the section and fixing the programme of procedure.<br>Terminal stations for passengers.<br>Terminal stations for passengers. (*Continued and end.*) | Installation of the section and fixing the programme of procedure.<br>XIII. Net cost — Rates.<br>. . | Installation of the section and fixing the programme of procedure.<br>XVII. Carriages and wagons for light railways.<br>. . . |
| Goods [freight] stations.<br>. . . | XIII. Net cost. — Rates. (*Continued and end.*)<br>. . . | XVIII. Operation of light railways. — Working rules and regulations.<br>. . . |
| Goods [freight] stations. (*Continued.*)<br>Slow-freight traffic.<br>. . . | XVI. Workmen's dwellings. | XVIII. Operation of light railways. — Working rules and regulations. (*Continued and end.*)<br>XIX. Special methods of traction on light railways.<br>. . . |
| Goods [freight] stations. (*Continued and end.*)<br>Slow-freight traffic. (*Continued* )<br>. . . | XV. Interchange of rolling stock.<br>XVI. Workmen's dwellings. (*Continued and end.*)<br>. . . | . . .<br>. . . |
| Slow-freight traffic. (*Continued.*) | XV. Interchange of rolling stock. (*Continued and end.*)<br>. . . | XX. Safety appliances on light railways.<br>. . . |
| Slow-freight traffic. (*Continued and end.*)<br>Locomotive cab signals.<br>General meeting. | XIV. Custom's examination.<br>General meeting. | . . .<br>General meeting. |
| Locomotive cab signals. (*Continued and end.*)<br>*With section II.*<br>General meeting. | . . .<br>General meeting. | . . .<br>General meeting. |
| neral meeting and closing ceremony. | General meeting and closing ceremony. | General meeting and closing ceremony. |

# SUMMARY REPORT OF THE DISCUSSIONS

## IN THE SECTIONS

## SECTION I.

### Way and Works.

Mr. Mauris, member of the Permanent Commission, opened the proceedings of the 1st section. The first business was the selection of the following officials who were elected with acclamation :

*President* : F. Bruneel.
*Vice-presidents* : A. Barrand and H. Deyl.
*Principal secretary* : G. Tronconi.

Mr. Bruneel upon taking the Chair gave the following address :

« Gentlemen,

« My first word must be one of thanks and gratitude for the very great honour the 1st section has paid my country in calling upon me to preside over its deliberations. I thank you also personnally for the honour, and I feel very deeply the way in which you received the kind words, too kind in fact, in which Mr. Mauris referred in terms, which touched me very much, to the work which I have carried out, especially that in connection with the Nord-Midi Junction at Brussels to which I have been attached all my life. No one could appreciate more highly than I do the high honour and the important work you have confided to me. I have, in fact, the privilege — the sad privilege which comes with age — of being one of the oldest members of the Congress. I am one of the three or four members left who took part in the first proceedings in 1885 — that is to say 27 years ago — which started these meetings. I may truly say that I know how important the reports we have received are, and what happy results have followed the work we have all helped to carry out.

« With Mr. Mauris I believe that the work of this section will be fruitful in its results.

« Before we settle down to our work, I wish to render homage to the country in which we are met, — Noble Italy, — so great in the past and in the recent tragic hours we have passed through, still further raised in the esteem and admiration of the world.

« We bow solemnly before her. (*Ap-*

*plause.*) I also salute our dear Italian colleagues, so given to hospitality; we feel deeply touched by the hospitality shown us, so cordial, so sincere and so full of attention. I would I were able at this time to express myself in their beautiful language, so musical and so full of harmony. It is a language which enchants our ears as their wonderful country does our eyes.

« We wish to offer them here and now the cordial assurance of our friendship, and we appreciate very fully the hospitality which they offer us, and above all the hearty welcome with which we have been received. (*Applause.*)

« And now, Gentlemen, with regard to our meeting, what we have to carry out will be of considerable length and arduous; the reports we have all received show the importance of the work which we have to carry out. I feel I am correct when I say that some of the reports are truly monographs on the subjects they deal with. We have to put much into our work, and I hope — for this will be the ultimate work of my connection with the Congress — that this session from the point of view of results, will not be any less successful than the session of previous congresses.

« I know that I shall have the help and assistance of you all, and I do not doubt that most satisfactory results will crown our efforts. » (*Applause.*)

Mr. TRONCONI (*Italian State Railway*) thanked Mr. Bruneel for the very kind words that he had spoken with regard to Italy.

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## QUESTION I.

### Construction of the road bed and of the track.

Arrangements to be adopted in constructing the road bed and the track, in view of the increase in the weight of locomotives and the speed of trains.

#### Preliminary documents.

1st report (America), by Mr. H. U. MUDGE. (See English edition of the *Bulletin* of August 1914, p. 713, or separate issue [with red cover] No. 2.)

2nd report (all countries, except Denmark, Sweden, Norway, Great-Britain and America), by Messrs. HENRY and CANDELIER. (See English edition of the *Bulletin* of October 1920, p. 639, or separate issue [with red cover] No. 8.)

Supplement to 2nd report, by Messrs. HENRY and CANDELIER. (See English edition of the *Bulletin* of January 1922, p. 251, or separate issue [with red cover] No. 56.)

3rd report (America), by Mr. C. H. EWING. (See English edition of the *Bulletin* of July 1921, p. 835, or separate issue [with red cover] No. 20.)

4th report (Denmark, Sweden and Norway), by Mr. K. AHLBERG. (See English edition of the *Bulletin* of September 1921, p. 1147, or separate issue [with red cover] No. 28.)

5th report (Great-Britain), by Mr. E. F. C. TRENCH. (See English edition of the *Bulletin* of August 1921, p. 991, or separate issue [with red cover] No. 24.)

Special reporter : Mr. HENRY. (See English edition of the *Bulletin* of April 1922, p. 623.)

#### Report of the 1st section.

(See *Daily Journal of the session*, No. 6, p. 8.)

Mr. BRUNEEL opened the discussion on question I, and called upon Mr. HENRY (*special reporter*) who read a summary which he had prepared of the reports of Messrs. Mudge, Ewing, Henry and Candelier, Ahlberg and Trench.

THE PRESIDENT pointed out to the reporter that each of them was at liberty to raise any objection he liked to Mr. Henry's summary. In the meantime he pointed out that the subject naturally divided itself into two parts, namely :

1° Strengthening the track;
2° The road bed.

Dealing with the first of these he called upon Mr. Ahlberg (*reporter*) to make some supplementary remarks with regard to the method of hastening the settlement of embankments on very soft clay which he had mentioned in his report. He also asked if the French translation of his report (No. 4) expressed fully his ideas.

Mr. AHLBERG stated the method described in his report for hastening the settling down of embankments on very soft clay had been used several times in Norway, where such ground was found, considerable settlement had in this way been quickly obtained which allowed the embankment to reach the firm sub-soil by the lateral displacement of soft clay. At one particular point the embankment had sunk from 13 to 16 feet.

Mr. HENRY dealt with the use of intercepting side drains for cuttings, these he stated finally became choked and caused water pockets, resulting in bad slips. He did not recommend the system unless the drains are made of sufficient size to allow of easy inspection.

THE PRESIDENT mentioned the successful application of this type of drain used during the construction of a line through very wet ground across the old war front.

Mr. BARRAND (*French Government*) stated that he had seen a number of plans sent in to the Bridges and Roads Department for the consolidation of slips caused by these drains.

Mr. GUZMAN (*Ecuador Government*) spoke of the difficulties he had experienced during the construction of a railway on volcanic ground of such an unstable nature that they were hardly able to advance a yard in three months.

THE PRESIDENT then opened the discussion on the method of strengthening the track by the use of concrete or ferro-concrete. In Belgium they had not found many cases where this was necessary. He called to mind however a particular case of a section of the Brussels-Ostend line which crossed a bed of « paniselienne » clay. The clay sub-soil worked up through the ballast, and had to be excavated for a depth of about 6 1/2 feet and replaced by good earth.

Mr. TINTANT (*Eastern Railway of France*) stated that beds of concrete are used by them in tunnels where the soil is of a clayey nature and softened by water. These were of two kinds :

1° A slab of concrete without reinforcement, 10 to 12 inches thick;
2° A slab of reinforced concrete of about half this thickness.

The Eastern Company decided to use this second solution in order to reduce the surplus expense in earth work; this work was carried out under one road whilst the traffic was carried over the other line.

Mr. QUINQUET (*Paris, Lyons & Mediterranean Railway*) spoke of the running of an open trench in a marl sub-soil. He also mentioned the use of a concrete bed without anchorage — this was covered with a layer of sand two inches in thickness, which allowed for the distribution of the pressure of the ballast on to the concrete. This work was carried out two years ago, and they were still awaiting the results of the experiment.

Mr. DREYFUSS (*French State Railway*) detailed the work of consolidation of road bed which had been carried out on the French State Railway.

Mr. TETTELIN (*Northern Railway of France*) mentioned that in 1913 they had used a bed of concrete under a road having four tracks. The line had stood up to its work very well, and he concluded that with ground which became muddy when wet (loamy clay) a bed of this description solved the difficulty.

Mr. JULLIEN (*Paris-Orleans Railway*) was rather pessimistic with regard to what had been said, and pointed out that clay tended to take a sinuous form with the result that the concrete broke by the hollow places. In place of the operations described he preferred to clear the soil away and make a bed in the form of a saddle back filling the excavation with fine ashes upon which a thick bed of ashes was put for the ballast to be placed on.

Mr. ANDREAE (*Swiss Government*) remarked that in tunnels they had found that it was better to use an inverted arch of ordinary masonry, a concrete slab did not give good results.

Mr. QUINQUET called attention to the fact, which also stated Mr. EWING (*reporter*), that it was not advisable to put broken stone in contact with marl. He spoke of his experience in using longitudinal dwarf walls for consolidating the road bed, the use of which had proved very satisfactory.

THE PRESIDENT raised the point of the employment of an intermediate layer of ashes or fine sand, and asked the English speaking delegates if they would give their experience of this method of construction.

Mr. TRENCH (*reporter*) stated that in England it had not been found necessary to use concrete beds, even the most unstable clay formations had been successfully dealt with by means of a thorough system of drainage and by placing under the ballast a suitable layer of ashes or sand. He noted the favourable results which had been obtained in France by means of longitudinal dwarf walls, a method of which he was ignorant. He mentioned in passing the advantages obtained by « shovel packing » for consolidating the sleeper beds. This method originated in England, but has now beeen adopted by the Northern and other French railways.

Mr. JULLIEN stated three of the six railway systems in France used the flat bottom rail, and three, including the Paris-Orleans Company, a double-headed rail, which by means of chairs allowed the use of soft wood sleepers; he added his Company were leaning towards the adaptation of the Vignoles rail, owing to the simplification of the attachments in point and crossing work.

THE PRESIDENT called attention to the advantages of long rails; the standard rail in Belgium is 59 feet, but longer rails (78 ft. 8 in.) are also laid down where it is advantageous to reduce the number of joints as for instance on iron bridges.

Mr. JULLIEN drew attention to the fact that if the rail exceeded 59 feet, deformation might be caused in some cases.

Mr. DEYL (*Czecho-Slovakia State Railway*) said their practice was to use a 49 ft. 3 in. rail.

Mr. GRIERSON (*Great Western Railway*) pointed out that the question of the drainage of the road bed is generally well understood. He went on to make several general remarks on the methods employed in building up the track. In his opinion the fastening down of the rail by means of spikes was not a good one; unfortunately there was no delegate from the United States present at the meeting wo could have answered Mr. Tintant's question as to the advantages which American Engineers attributed to this method of fastening which is the one usually adopted by the majority of American railways.

Mr. DEYL recommended the test of the ballast which had been brought out by Professor Spaeek of the Prague Institute.

THE PRESIDENT raised the question of the relative merits of the two systems of laying the rails — with joints opposite one another or with joints broken — mentioning that in Belgium both methods were employed.

Mr. JULLIEN considered that the method of using broken joints would have to be abandoned owing to the swaying action which it caused in the coaches.

The final discussion dealt with the point as to whether rails should be laid vertically or inclined inwards 1 in 20.

Mr. HENRY stated that in France they had reverted to laying rails at an incline of 1 in 20, and the tendency appeared to be the same in America. If the rails were laid vertically, there is a tendency to unequal wear at the head of the rail.

THE PRESIDENT called upon Mr. Henry, special reporter, who put forward the following as covering the discussion on the 1st question.

### Final summary.

« During the past ten years the maximum speed of trains has not been increased, but there has been a considerable increase in the number of trains travelling at high speed, and this applies more particularly to goods trains.

« The weight of trains have also increased appreciably as have the axle loads. Some mineral trains now impose on the track loads which are comparable with trains composed entirely of locomotive engines.

« The passing of these greater loads at high speed has resulted in increased wear and tear of the track, but so far these conditions have not increased appreciably the cost of ordinary maintenance.

« The increased wear and tear has been successfully dealt with : 1° by undertaking in good time all necessary repairs; 2° by carrying out the relaying of the track at shorter intervals, and 3° by taking such steps as are necessary to equalise as far as possible the distribution of pressure on the roadbed.

« When relaying the track it is not unusual to adopt one or all of the following improvements :

« 1° To increase the depth of the ballast;

« 2° To increase the number of sleepers;

« 3° To lay down rails of greater weight.

« In the construction of new lines, the following measures are recommended :

« *Road bed.* — Every effort should be made to secure the greatest stability of the roadbed by means of efficient

« drainage in the cuttings and on embankments by selecting the best available material for the upper portion of « the embankments.

« In certain cases where the formation « is particulary unstable, a layer of « concrete has been laid down under the « ballast. Some engineers report favourably on this method of construction, others are doubtful of its value. « In any case the cost is exceedingly « high.

« If intercepting side drains are used « to prevent sub-soil water from gaining « access to cuttings, these drains should « be of large size.

« *Ballast.* — The total thickness of top « and bottom ballast should depend on « the solidity of the roadbed. It should « vary from 1 to 2 feet below the sleepers, « the two layers being divided into suitable proportions.

« The bottom ballast should consist of « permeable material, which, while providing free drainage for surface water, « will still be sufficiently close to prevent « clay working up through the ballast.

« The choice of material for top ballast must depend on the resources of « the district. The best appear to be « hard stone or furnace slag broken to « suitable size. Where gravel is used, it « should include from 12 to 14 % of « broken pebbles, and from 20 to 25 % « of sand. The thickness under the « sleepers should be not less than from « 6 to 8 inches.

« *Sleepers.* — For the flat bottomed « rail, the spacing of sleepers should be « as a rule 2 ft. 2 1/4 in. between sleepers. « For chaired road 2 ft. 7 1/2 in. between « sleepers.

« *Rails.* — The minimum weight of « rails should be 72 lb. per yard.

« For more important lines : 92 to « 100 lb. per yard.

« Some American Companies have, on « lines of heavy traffic, laid down rails « weighing 130 lb. per yard; this has « allowed them to use high carbon steels.

« For tunnels, rails of about 110 lb. « per yard are recommended. »

— No objection having been made the President declared this summary to be adopted.

— The general meeting ratified this summary at its meeting of 26 April.

## QUESTION II.

### Maintenance and supervision of the track.

Measures to be taken to provide an economic organization for the maintenance and the supervision of the track, taking into consideration the increase of traffic and speed as well as the rise in wages and in the cost of materials. Use of mechanical appliances. Results obtained.

#### Preliminary documents.

1st report (America), by Mr. E. Randolph. (See English edition of the *Bulletin* of October 1920, p. 665, or separate issue [with red cover] No. 9.)

2nd report (Great-Britain), by Mr. Chas. J. Brown. (See English edition of the *Bulletin* of June 1921, p. 663, or separate issue [with red cover] No. 18.)

3rd report (America), by Mr. E. Stimson. (See English edition of the *Bulletin* of August 1921, p. 977, or separate issue [with red cover] No. 23.)

4th report (all countries, except Great-Britain and America), by Mr. J. Barbieri. (See English edition of the *Bul-*

*letin* of January 1922, p. 139, or separate issue [with red cover] No. 54.)

Special reporter : Mr. E. STIMSON. (See English edition of the *Bulletin* of April 1922, p. 631.)

### Report of the 1st section.

(See *Daily Journal of the session*, No. 8, p. 4.)

THE PRESIDENT opened the discussion on the maintenance and supervision of the track.

Mr. BROWN (*reporter*) in the absence of Mr. E. Stimson (*special reporter*) read the summary which the latter had prepared of the four reports of Messrs. Randolph, Brown, Stimson and Barbieri.

THE PRESIDENT remarked that the summary of Mr. Stimson constituted a complete and well detailed report of the whole question, and proposed to limit the discussion to several particular points, and especially to the methods employed with a view of reducing the cost of maintaining the track. He recalled that when he was reporter on the same subject at the St. Petersburg Congress in 1892, the number of men employed in the repair gangs at that time was the same as that mentioned in the special report just read. He wished the discussion to deal with a new point, and that was whether the throwing together of small gangs really effected an appreciable economy.

Mr. TETTELIN (*Northern Railway of France*) in reply to this point said that the use of « draisine » automobiles enabled the men carrying out the repairs with their equipment being quickly on the spot where the work was to be done, and also did away with fixed repair outfits. This method was also being tried on smaller lines.

Mr. QUINQUET (*Paris, Lyons & Mediterranean Railway*) stated that a trial of the system was also being made on the Paris-Lyons-Mediterranean Railway, the « draisines » being provided with portable telephones which allowed communication being made with the adjacent stations, so that they might be informed of the moment the « draisine » was derailed, and the road cleared for traffic.

This system had given good results on single lines with little traffic. He thought that it would be advantageous to employ more powerful « draisines » for the transport of men and material. A gang provided with a « draisine » automobile ought to be able to look after the maintenance of a section of from 10 to 12 miles.

Mr. JULLIEN (*Paris-Orleans Railway*) gives an account which will be published in a forthcoming number of the *Bulletin* on the organisation of the maintenance of the track on the secondary line from Blois to Villefranche-sur-Cher. This line, which is 33 1/2 miles long, has been divided into four sections for inspection, and into two for maintenance. Each of these use a « draisine » for the transport of men and material .

The difference from the system described by Mr. Quinquet is that on the main line there are a number of sidings in which the « draisines » can be placed. Telephones are provided at these sidings so that the neighbouring stations can be communicated with, and by these means it can be ascertained when the « draisine » may run on the line.

This organisation works very well, and up to the present has resulted in an economy of about 1 400 fr. per km. per annum.

THE PRESIDENT requested that the

subject of the repair of the track by contract should be discussed:

Mr. HENRY (*Eastern Railway of France*) said that before the war, maintenance and relaying were carried out by contractors on the Eastern Railway with satisfactory results. It should be stated that the more delicate work of levelling and alignment was carried out by the Company's men.

Mr. QUINQUET mentioned the good results obtained with the Collet system, and called particular attention to the fact that mechanical packing gave a more elastic ballast under the sleeper, than with hand packing.

Mr. BARBIERI (*reporter*) said that since 1908 they had entrusted the repairs of 1243 miles of line to a private company working with the Collet system. The results have been very satisfactory.

Since the armistice they had let by contract general repair work. Good results had been obtained especially in the North of Italy. On the Padua section, dealing with the relaying of 115 miles, an economy of 40 % had resulted.

Mr. Barbieri also called attention to the remarks on this subject (mechanical appliances) in his report. He said that after a couple of trials with mechanical apparatus for boring and packing the sleepers satisfactory results had been obtained. It was possible to pack from 95 to 100 sleepers per hour, an economy of 25 % being obtained as compared with similar work carried out by the ordinary method. This success had led Italy to go still further with trials of this description by means of six new machines which are on order. These machines which only carry out a portion of the work required for a general relaying are somewhat inconvenient in that it is not always possible to use them economically as they require working to their full capacity in order to give the best results.

Under certain circumstances it has been necessary to discontinue working the machine every other day in order to allow the smaller gang of men employed to complete the work carried out mechanically.

The actual tendency of the Italian State Railways is to have the work of general relaying carried out by co-operative contract. The people employed are old casual employees of the railway, the State finding the necessary material, distributing it along the line and taking charge of the spent and scrap material taken from the track. The Italian State is in reality seeking to obtain the best result by interesting the worker in the work carried out by means of the payment of bonuses.

Mr. COOMBER (*Lancashire & Yorkshire Railway*) stated that the opinion which prevailed on the English railways is that relaying and repairs cannot be satisfactorily carried out by contract. In fact contrary to the opinion expressed by Mr. Stimson in his report, men employed by private contractors would not work at a lower wage than men engaged directly by the companies.

THE PRESIDENT opened the discussion on the inspection of the permanent way, and said that at the Congress at St.Petersburg it was proposed to reduce this to one visit per day. He further stated that at that time it had also been recommended to do away with gatemen at the less important level crossings.

These recommendations had been put into force in Belgium since the armistice, and had resulted in an economy of more than a million francs in inspection, and of 3 1/2 million francs by doing away with the gatemen at certain level crossings. This latter procedure had not resulted in any untoward incident, and now seem to be well established.

He asked if similar arrangements had been introduced on other railways.

Mr. PRETORIAN (*Roumanian State Railway*) said that on the railways he was associated with only the more important level crossings had gatemen.

Mr. QUINQUET said the results in Belgium had been favourable, and hoped that similar measures would be taken in France.

Mr. BROWN said he fully appreciated the importance of the diminution of the cost of repairs of the track, and thought that standardisation of work ought to be applied in this case. The better distribution of the men, especially by the increase of the length of the section, and the utilisation of « draisines » ought to be considered. With regard to the inspection of the road, this was only done once a day in England. On the less important crossings on branch lines no gatemen were provided, but they were simply furnished with « cattle guards »; on important lines all level crossings were guarded.

Mr. BARBIERI said that on the Italian railways they had 17 000 level crossings, certain of which were not guarded before the war in conformity with the regulations of the law on guarding crossings.

The introduction of the eight hour Act had caused a Royal decree to be promulgated authorising the Italian State to dispense with gatemen at all level crossings which are sufficiently visible from the road and the rail. These regulations will be gradually applied, and will finally result in the withdrawing of gatemen from about 6 000 level crossings, which are however to be provided with warning boards.

Experiments are being made with a view to providing automatic signals at the more important level crossings or where these were not sufficiently visible, in order to do away with gatemen at these points.

The number of inspections of the line has also been reduced to a minimum of one per day on the less important lines. The result of these steps has already effected an annual economy of 30 million, a figure which will be doubled when the regulations mentioned above have been applied universally.

In order to reduce the number of men engaged in lighting and control of signals, the Italian State Railway will carry out experiments on the Rome-Orte line with a view to utilising electric light or acetylene with a flickering flame for lighting signals.

Mr. TRENCH (*London & North Western Railway*) stated he had listened with interest to the points which Mr. Brown had raised on the subject of the reorganisation of the repairs staff, and particularly the one relating to the increase of the sections looked after by one gang. On the subject of the use of mechanical apparatus, Mr. BROWN called attention to the good results obtained by means of hopper wagons arranged to discharge automatically.

With regard to the employment of mechanical packing devices for ordinary repairs, Mr. TRENCH thought that the difficulties of management had been surmounted to a great degree. He believed that a good result should be obtained from the use of machines on ordinary repair work, as any small defect could be dealt with on the spot. The machines however ought only to be used on lines of certain importance.

After the above points had been raised the following were adopted with regard to the second question.

### Final summary.

« 1° The attention of Engineers in charge of maintenance of track should be
« directed to close supervision and systematic control of the work of the maintenance staff, also to such reorganisation, wherever possible, as will enable advantageous use to be made of mechanical appliances, with a view to greater efficiency and economy;

« 2° One of such methods of reorganisation is to group together at a convenient centre a number of small gangs into one large gang, equipped with means of rapid transport, thereby permitting better supervision, greater efficiency of labour and consequent reduction in the total number of men required;

« 3° A track of ample strength and well-laid in the first instance, is essential to subsequent economical maintenance;

« 4° The employment of contractors for the maintenance of the track is not favoured by all Companies. This method may or may not be advantageous according to local circumstances;

« 5° Means should be adopted to ensure the re-use of any serviceable material, in order to save the expense of supplying new material, and at the same time to discard any material which is considered as unfit for further use;

« 6° Inspection of the track should not be made more than once daily, and under certain circumstances may be reduced or even dispensed with;

« 7° Where legislation permits, reducing or even abolition of level-crossing-keepers offers further possibilities of effecting considerable economy. »

— The general meeting ratified this summary at the meeting held on 27 April.

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## QUESTION III.

### Special steels.

Use of special steels, both for the track generally, and in particular for the track appliances (points, crossings, etc.).

### Preliminary documents.

1st report (America), by Mr. W. C. Cushing. (See English edition of the *Bulletin* of June 1921, p. 577, or separate issue [with red cover] No. 16.)

2nd report (all countries, except France and America), by Mr. Sand. (See English edition of the *Bulletin* of September 1920, p. 563, or separate issue [with red cover] No. 6.)

Supplement to the 2nd report, by Mr. Sand. (See English edition of the *Bulletin* of August 1921, p. 1103, or separate issue [with red cover] No. 26.)

3rd report (France), by Mr. Mesnager. (See English edition of the *Bulletin* of December 1921, p. 2025, or separate issue [with red cover] No. 45.)

Special reporter : Mr. Mesnager. (See English edition of the *Bulletin* of April 1922, p. 730.)

### Report of the 1st section.

(See *Daily Journal of the session*, No. 9, p. 6.)

The discussion was opened on question III which dealt with Special Steels. Mr. Mesnager (*special reporter*) spoke as follows :

In the remarkable report of Mr. Cushing, full of interesting information, he calls attention to the conclusion of the Congress of 1900, in which it is pointed out that anything which will help the question of the gap in the crossings or frog will be of the greatest benefit. At that time the weight on a locomotive axle never exceeded 25 tons or on a wagon axle 18 tons. But now it has been recognised that the increase in loads (to 30 tons and then 33 tons) and in the speed over crossings has altered the problem, and one has now to turn to special metals for crossings, etc. In 1910 Mr. Besler (*reporter for America*) suggested at the Berne Congress that rigid crossings should be of manganese steel. This suggestion was turned down by the section, but the question of the metal for crossings was kept on the programme by the full meeting.

Mr. Cushing pointed out that manganese steel was invented by Hadfield in 1887, and that the first crossing of this metal was placed on a steam railway in 1900 at a point where the speed was slow.

In what follows — Mr. MESNAGER said — I will speak not only of the United States of America, but of other countries in order not to go over the same ground several times.

*Characteristics.* — Manganese steel is characterised by its strength and resistance to wear. Generally its composition is :

| | |
|---|---|
| Manganese. . . . . . . | 10 to 14 %. |
| Carbon. . . . . . . . . . | 1.3 %. |
| Phosphorus . . . . . | Under 0.1 %. |
| Silicon. . . . . . . . . | From 0 30 to 0.90 %. |

The manganese contents is limited by the price of that element, which before the war was obtained from Russia and India and today comes — at all events for America from Brazil, Cuba, Central America and the United States.

By a proper heat treatment — tempered at 900° C. (1 652° F.) the cementite is transformed into austenite, more ductile and more capable of resisting wear. The metal then has the following physical characteristics :

| | | |
|---|---|---|
| Elastic limit.......... | 19 to 38 | English tons per square inch. |
| Ultimate strength... | 44 1/2 to 74 | |
| Elongation .... ...... | 15 to 45 %. | |

When rolled it usually contains less phosphorus and silicon, and is stronger than cast metal. In this state it does not usually fall below :

Elastic limit : tons per square inch.
America. . 28 1/2 | France . . . . 60
Ultimate strength : tons per square inch.
America . . . 52 | France . . . . 57
Elongation ; 15 to 45 %.

One of the great difficulties with it is that it has a shrinkage of 2.6 % in casting.

At present it has chiefly been used for crossings and other fixed apparatus of the permanent way.

In America it is stated that it is economical to use this steel where ordinary apparatus wears out in twenty months. The price is double, but the life is six times as great. As a result of the information supplied by the American Companies it may be said that they are in agreement *that manganese steel is satisfactory and economical at points where the service is heavy and the trains numerous.*

*Rails.* — Beside its principal employment on crossings built up of rails or in a single piece, it has been used for rails on curves of small radius where the wear has been very great, and on rails where the speed is low, such as Metropolitan Tube Railways. It has the objection of being difficult to cut to length or where it is necessary to machine it at the joints.

*Check rails.* — It is now used on a very large scale in America. In Algiers it is employed for the sliding portions of expansion apparatus.

With regard to other special steels, the information which has been received is contrary and inconclusive.

In every case it would seem that the use of high tensile carbon steel gives only moderate results, and leads to frequent fractures.

Only Sandberg treated steel, which has a sorbitic microstructure would seem to be of interest: « the results so far are sufficiently favourable to continue the trials ». Mr. Sandberg, who is present at this meeting, would be able to complete the information given by Mr. Cushing of results which have been obtained since the publication of the report.

Mr. Mesnager afterwards read conclusions of the report from Mr. Cushing, and added that the information received by Mr. Sand (*reporter*) showed that on several of the Spanish lines all the crossings were made of manganese steel.

In France, the Paris-Orleans Railway, after a series of trials which commenced in 1906, decided to replace all the crossings on their main lines with this metal.

The Metropolitan Railway in Paris are equally satisfied with the employment of crossings made of manganese steel — they found it advantageous and also decidedly economical.

Other special steels are stated to be advantageous under particular circumstances, but one cannot yet say for any one of them that everyone is in accord as to the conditions where they may be employed with advantage. They are in fact not yet beyond the experimental stage.

It is desirable that this question should continue to receive attention, it being possible that several special steels will show within a short period a decided superiority for particular applications.

THE PRESIDENT proposed to limit the discussion to particular points without entering into the details of the manufacture of the special steels. He asked in the first place for information with regard to specifications of manganese steel imposed by the companies which used it.

Mr. JULLIEN (*Paris-Orleans Railway*) replied that the French Companies had not prepared a regular specification, but they dealt with manufacturers in whom they had every confidence to supply what was required. He asked the delegates representing English speaking countries to give information on the following points :

1° Has the introduction of manganese steel caused the use of spring crossings to be abandoned?

2° Does one in England pay a price for manganese steel three times in excess of that for ordinary steel? In France the price is only double;

3° In America do they fit the manganese steel crossings for re-use in simply grinding them, or do they first of all put them in a press with a view to making them exactly the right shape?

4° Are rolling mills for manganese steel rails yet in working in England?

Mr. COOPER (*City & South London Railway*) stated that his Company always used spring crossings. He went on to say that during the twenty or so years they had employed manganese steels, they had obtained very favourable results, and a great economy as compared with ordinary steel. The general life of apparatus made in manganese steel is from six to ten times as long as that obtained from ordinary steel. With regard to the cost, Mr. Cooper was only able to give pre-war figures, — manganese steel cost £27 per ton as compared with £7 per ton for ordinary steel or about four times as much.

Manganese steel rails are used on curves of small radius on lines where the traffic is intense, and the wear very great. In order to give an idea of the great durability of manganese steel rails, he stated that at places where ordinary steel rails were worn out in twelve months, they substituted five years ago manganese steel rails which were still in service, and from which they hoped to get three more years wear. The increase of life is therefore in the proportion of 1 to 8.

On very sharp curves (5 chains), it has been found that rails are scraped, not because of their loss of weight, but owing to their having become corrugated.

The same may be said of the sorbitic rails used on the District Railway which had otherwise given satisfactory results, but have been taken out of service for the same reason. The advantage of sorbitic steel should be from 80 tot 90 %, but this is reduced to 40 % as they also had to be withdrawn owing to corrugation.

Mr. de Boulongne (*Paris, Lyons & Mediterranean Railway*) thought that it ought to be more advantageous to employ apparatus cast in a single piece than to use crossings built up of rails, and asked for information from engineers who had employed this method.

Mr. Jullien stated that before the war the Paris-Orleans Railway only used apparatus built up of ordinary steel, but owing to the difficulty of procuring this, the Company, since the armistice, had used apparatus cast in one piece of manganese steel, and had not ordered any other.

Mr. Cambournac (*Northern Railway of France*) stated he did not follow any absolute rule, and that under certain circumstances, as on curves, the use of cast apparatus which could not be « set », as required, presented difficulties. On the other hand the use of apparatus of manganese steel, either cast or built-up, was of great interest on lines with dense traffic, but because of its high price it did not offer the same advantages on lines where the traffic is small.

Mr. Balling (*Paris-Orleans Railway*) stated that he was in agreement with those last points. The Paris-Orleans Company at present only ordered apparatus of manganese steel for their main lines; apparatus of the old type was taken out and used for repair work on less important lines where it would last for many years.

Mr. Cooper said he had obtained excellent results with cast apparatus, but agreed that this was chiefly on points where the speed is low (this is notably the case on the District Railway). His experience was that apparatus built-up of rails works best where the speed over points is great.

Mr. Willem (*Belgian State Railway*) spoke of the utilisation of crossings of manganese steel for light railways where, owing to local conditions, apparatus of ordinary steel was found to give bad results from a maintenance standpoint.

The prohibitive price of manganese steel however limited its employment, and it would be of interest to fix proper specifications for reception.

Mr. Schrafl (*reporter speaking in the*

*place of Mr. Sand, deceased*) stated that crossings of manganese steel cast in one piece had been on trial since 1910 at points where the traffic is dense, and had given very good results; and still after twelve years use it was not possible to fix their future life, even approximately. These crossings had however two grave defects, *e. g.*, as manganese steel could not be drilled it was necessary to have special fishplates closely fixed to keep the crossings in position, and if one of these broke it was difficult to replace it as quickly as necessary. The second point is that in Switzerland these crossings are very costly, much more so in fact than the price the French Railways say they are paying for them, therefore, except for certain exceptional cases, this high cost made their use prohibitive.

Manganese steel is at the same time ductile, strong and very hard, and offers a great resistance to wear.

These qualities however are not indispensable for all parts of a crossing. They are only really useful at the portions which are subjected to shock and friction.

Bearing these latter points in mind, manganese steel used only in those portions of the apparatus renders it as durable as cast steel crossings, with very much less cost and would allow of the use of normal fishplates for connection with the other portions.

In addition to this for several years we had fitted manganese steel plates to the wing rail of a certain number of crossings at the point where the tyre passes over the wing rail. The crossings of built up rails which have been fitted in this manner, and of which ten were put into position in 1912 in the sidings to the entrance to the stations, are perfectly intact at the present day. One of the Permanent way Engineers of the Swiss State Railway has stated that after ten years some of the crossings in his section are no more worn than crossings of built-up rails, without insertion plates, after three months service. He also points out that from an economic point of view, it is desirable that these insertion plates should be generally adopted. This system has shown that the employment of insertion plates of manganese steel in crossings ought to be much more frequently used in Switzerland, and this would have been done so if the war and the economy which has resulted from it, had not imposed such stringent regulations with regard to expenditure on repairs. Undoubtedly when circumstances are more propitious recourse will be had to this method.

Mr. de Boulongne asked Mr. Cooper if his remarks with regard to the premature scrapping of cast steel apparatus, which was attributable to a defect in workmanship, applied to recently constructed apparatus.

Mr. Cooper replied that the actual workmanship with manganese steel and with apparatus of ordinary cast steel was good.

The discussion was then opened on the employment of steel with a sorbitic microstructure as given by the Sandberg process.

Mr. Cambournac asked whether sorbitic treated rails were employed, and if the price is lower than for manganese steel rails and also he wished to know where they are employed.

Mr. Sandberg (*Siamese Government*) said that in all cases where points and crossings have only a life of four or five years he strongly recommended the employment of manganese steel.

The employment of Sandberg sorbitic steel for crossings, etc., will give results very superior to those attained with ordinary steel, in that they offer much greater resistance to wear and crushing.

Since the time when Mr. Cushing wrote his report, the results obtained from the « Turkey Hill Curve » of the Pennsylvania had been published by Mr. Strand (chief engineer) who had kindly given the complete results to Mr. Sandberg, and had given him authority to quote them.

These showed that rails of Sandberg sorbitic steel had increased the life by 85 %, whilst the extra cost of the work was only 12 % above that of ordinary steel.

These experiments covered a period of two years, and were carried out on rails weighing 130 lb. per yard, which were rolled by the Bethlehem Steel Company from steel having 0.7 % of carbon.

The « Boston Elevated Railway » had found that Sandberg rails gave a life twice that of ordinary carbon steel rails. Actually about fifty railway companies in different parts of the world are making experiments with rails and tyres manufactured by the Sandberg process. As the sorbitic microstructure is combined with more ductility in the main body of the rail, it is an ideal material for such purposes.

The use of higher carbon contents steel or increasing the weight of the rails is a less favourable means of solving the problem.

Springs, which ought to have the highest possible elastic limit to resist shock, ought also to be treated so as to give a sorbitic structure.

Without a great increase in weight, one is able to have rails with a sorbitic structure, which allows them to acquire much greater resistance to wear and crushing than is the case with ordinary steel rails. Within any years the trials on railways, which at present are being carried out, will be probably completed.

A discussion took place between Mr. Willem and Mr. Sandberg as to the proper proportion of silicon, and the effect it had on deoxidising the steel.

M. Mesnager read a note on the production of cracks on the surface of rails. He mentioned a method of producing these cracks experimentally by heating the surface of the rail to a « straw » heat, the body of the rail being kept in water, which was the condition he believed they were subjected to when the wheels were locked by the brake and skidded along the rails. He stated that one ought to submit steels to laboratory experiment to ascertain if they are likely to crack.

Mr. Sandberg said that the very interesting remarks of Mr. Mesnager on the microscopical cracks on the worn surface of rails confirmed his opinion of the serious consequences which might result from these.

He read a note on the interesting conference of the « Institution of Civil Engineers » which was held in June 1921, at which he reported the case of some rails which had broken into several pieces through this cause.

The President then called upon Mr. Mesnager who, on the result of the discussion, had drawn up the following summary on the subject.

### Final summary.

« 1° Cast manganese steel with 12 % of « manganese and 1.3 % of carbon gives « excellent results and is economical for « use in crossings. It is especially so in

« crossings cast in one piece. It is also « advantageous for rails on curves of « small radii in cases where the traffic is « dense and the speed low;

« 2° Opinion is not unanimous with « regard to the use of other special steels. « The superiority of any one of these is « not universally acknowledged;

« 3° Tempering rails is favoured by a « few engineers; the majority are against « this practice, except in cases where a « sorbitic structure is desired;

« 4° It is desirable that experiments be « continued to ascertain what are the best « conditions for the use of manganese « steel, also to determine the actual value « of other special steels and the best con- « ditions for their use, as well as to deter- « mine the causes of the failure of rails « in service. »

— This summary was unanimously agreed to by the section. THE PRESIDENT congratulated Mr. Mesnager on behalf of the delegates present on the admirable summary, and on the excellent way in which he had presented it.

— The general meeting ratified this summary at their meeting on 26 April.

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## QUESTION IV.

### Reinforced concrete.

Use of ordinary concrete and of reinforced concrete on railways.

#### Preliminary documents.

1st report (all countries, except Denmark, Sweden, Norway, Holland, Great-Britain and America), by Mr. M. CASTIAU. (See English edition of the *Bulletin* of February 1921, p. 99, or separate issue [with red cover] No. 12.)

2nd report (Holland), by Mr. C. LEEMANS. (See English edition of the *Bulletin* of January 1921, p. 3, or separate issue [with red cover] No. 11.)

1st supplement to the 2nd report, by Mr. C. LEEMANS. (See English edition of the *Bulletin* of August 1921, p. 1108, or separate issue [with red cover] No. 27.)

2nd supplement to the 2nd report, by Mr. C. LEEMANS. (See English edition of the *Bulletin* of February 1922, p. 347, or separate issue [with red cover] No. 59.)

3rd report (America), by Mr. C. H. CARTLIDGE. (See English edition of the *Bulletin* of December 1920, p. 815, or separate issue [with red cover] No. 10.)

4th report (America), by Mr. G. A. HAGGANDER. (See English edition of the *Bulletin* of July 1921, p. 743, or separate issue [with red cover] No. 19.)

5th report (Great-Britain), by Mr. W. W. GRIERSON. (See English edition of the *Bulletin* of July 1921, p. 761, or separate issue [with red cover] No. 19.)

6th report (all countries, except Denmark, Norway, Sweden, Holland, Great-Britain and America), by Mr. A. L. GOLARD. (See English edition of the *Bulletin* of November 1921, p. 1851, or separate issue [with red cover] No. 42.)

7th report (Denmark, Norway and Sweden), by Mr. P. M. BÜLOW. (See English edition of the *Bulletin* of January 1922, p. 25, or separate issue [with red cover] No. 51.)

Special reporter : Mr. W. W. GRIERSON. (See English edition of the *Bulletin* of April 1922, p. 643.)

#### Report of the 1st section.

(See *Daily Journal of the session*, No. 9, p. 6.)

At the invitation of the PRESIDENT, Mr. GRIERSON read his special report followed by a short summary. The points he developed in his own report were those relating to Great Britain. He laid special emphasis on the fact that one ought to be extremely careful in the construction of reinforced concrete as it was often found that the results of laboratory experiments were carried out under different conditions to those which pertained on the work itself. He also expressed doubt as to the durability of concrete work, and he thought that the effect of dynamic loads *(impact)* on reinforced concrete constructions was not thoroughly understood.

Mr. MESNAGER (*French Government*) did not agree with the doubts which Mr. Grierson had thrown upon direct tests, which ought to be reliable if carried out in the shops, or even on the works, as under these conditions the experiments ought to be sufficiently trustworthy to give confidence in the results.

On the other hand he would also point out that the remains of the Roman buildings in concrete is a guarantee of durability of erections in reinforced concrete.

With regard to the question of impact, the official regulations keep this sufficiently in mind, and he did not know of a failure of reinforced concrete when the calculations had been properly carried out in accordance with the regulations mentioned.

THE PRESIDENT asked Mr. Séjourné to speak on the question of the use of « Ciment fondu » (melted ciment) in tunnels.

Mr. SÉJOURNÉ (*Algerian section of the Paris, Lyons and Mediterranean Railway*) spoke of the experience on a tunnel of the Nice-Coni line where « Ciment fondu » alone had resisted the action of the water containing sulphates, all other cements having given bad results.

The actual experience with this material has now extended over five or six years, which should be sufficiently conclusive.

Mr. MESNAGER at the invitation of the President gave a short description of the characteristic properties of « Ciment fondu ». This material, which has a composition high in aluminates, acquires in about three days a strength equal to that which ordinary slow cement reaches in six weeks; it continues to harden in this manner which gives it two important advantages :

1° The possibility of removing the « shuttering » after a very short time;

2° The possibility of reducing (to about a half) the dimensions of the concrete members.

This cement costs double that of ordinary cement, but nevertheless gives a very considerable economy resulting partly in the carrying out of work with a limited quantity of « shuttering ».

Mr. BÜLOW (*reporter*) gave a resume of his report, and called particular attention to the necessity of proceeding with a careful mixing of the concrete.

THE PRESIDENT spoke very highly of the new material which had allowed them in Belgium to reconstruct in a specially rapid manner the works destroyed during the retreat of the conquered armies.

Having regard to the very large amount of ground which they had to cover, he proposed to limit the discussion to the several special applications of reinforced concrete. He particularly desired to call attention to the importance of the care necessary in carrying out works in reinforced concrete. He thought they should also spend some time on the question of under bridges, the influence of electric traction on work in reinforced concrete and on reinforced concrete sleepers. He pointed out in addition what might be called a secondary use of the material, such as the Belgian State Railways had put it to the manufacture of signal posts since the armistice.

Mr. Deyl (*Czecho-Slovakia State Railway*) spoke of very interesting work which had been carried out entailing a reinforced concrete arch having a span of 55 ft. 9 in. built at Pilsen by the Melan system, and of a railway bridge directly under the main roads, having an opening of 29 ft. 6 in. These constructions had given every satisfaction.

Mr. de Boulongne (*Paris, Lyons & Mediterranean Railway*) said that in his opinion cements with high silicon contents have mechanical properties comparable with those of « Ciment fondu », they retained in setting the properties of cements which set slowly. In the long run strength attained by this means are equivalent to those of « Ciment fondu ». He desired also to call the attention of this section to the necessity of taking every care in carrying out work in reinforced concrete, the defects which occur chiefly point to the use of too wet a mixture. He concluded by saying that he had every confidence in such works carried out under satisfactory conditions.

Mr. Lolli (*Italian State Railway*) stated that the Italian State Railway had constructed since 1900 more than 500 bridges in reinforced concrete, with straight girders. These are from 6 1/2 feet to 62 feet span, and are standing well up to the present. The cracks which have shown are solely due to the shrinkage of the cement, and not to the effect of the rolling load. The trials carried out in 1918 showed that these constructions had not suffered any diminution of strength. Dealing with the question put by Mr. Séjourné, Mr. Lolli stated that no oxidisation of the rods had occured due to these cracks.

Mr. Bauër (*French State Railway*) wished to inform the Congress that the results obtained by the French State Railways on bridges of reduced span over which trains run at high speeds had been satisfactory.

Mr. Quinquet (*Paris, Lyons & Mediterranean Railway*) made an interesting contribution to the discussion relative to the strengthening of certain cast iron work by means of reinforced concrete. The method employed consisted in placing round bars along the members in tensile stress and embedding them in concrete, this allowed of very considerable economy in the expense of strengthening the structure.

Mr. Bülow also gave a résumé of part of his report relating to under bridges.

Mr. Tintant (*Eastern Failway of France*) spoke of a bridge reaching a length of 82 feet constructed for the lines of a light railway.

The President mentioned the question of the effect of electric traction on under bridges. Exact information was not yet available on this point.

He then raised the discussion on the question of reinforced concrete sleepers.

Mr. Barbieri (*Italian State Railway*) gave an account of the trials on these made on the Italian State Railway. A summary of these had been published in the report of Mr. Golard, all that could be said at present was that the problem they presented was not solved.

The President said that he judged that in countries where trials of them had been made on a large scale the experiments had not been conclusive.

Mr. Balling (*Paris-Orleans Railway*) spoke of the trials being carried out by his company.

Mr. Desprets (Belgium) described the various methods which are employed in the manufacture of reinforced concrete sleepers. On the one hand the sleepers are shaped very similar to the wooden ones, whilst the other type consists of blocks under each rail joined together (type tried by the P.-L.-M.). It is remarkable to note that the sleepers last tried on the Italian State Railway and on the Paris-Orleans line are of the same length (7 ft. 10 1/2 in.), which is that of equal stress so as the length of 8 ft. 6 3/8 in. for a wooden sleeper is that of equal deformation. It is yet doubtful if the reinforcement used is sufficient. In this respect the sleepers consisting of two blocks rigidly united (P.-L.-M. type) ought to be better able to solve the question.

Mr. Balling thought that the attachment of the rail was a delicate matter with the material under discussion and that an ideal method of attachment had not yet been found.

Mr. Quinquet said that with sleepers consisting of *blocks* with a joining piece of reinforced concrete, most of the joining pieces broke in the middle.

Mr. Cambournac (*Northern Railway of France*) stated that they had recently constructed several bridge girders of this material on the Northern Railway, one of these for an arched bridge on the Belgian Sambre was 207 feet long. Up to the present the results had been satisfactory.

The Northern Company had followed, with interest, the experiments which other companies were making with reinforced concrete sleepers, but he did not believe they would at present employ them on his railway.

Mr. Duplaix and Mr. Dreyfuss (*French State Railway*) called attention to the destructive effects of the smoke from locomotives on reinforced concrete.

Mr. Mesnager pointed out that it was necessary to have a certain thickness of coating around the rods in order to preserve them from the effect of corrosive smoke. He also called attention to the fact that the lower footings of the masonry in tunnels are sometimes attacked by water containing sulphuric acid derived from the smoke.

Mr. Gioppo (*Italian State Railway*) gave an interesting account of the method of calculation employed for reinforced concrete structures to be erected in countries which were liable to earthquake shocks.

The President asked Mr. Desprets to read the reports of the meeting on the use of ordinary cement and of reinforced concrete on railways. This was adopted without discussion. Mr. Golard (*reporter*) then read a summary of the discussion on the various points. He appreciated very fully the report made by Mr. Grierson, but thought that the conclusions he drew up ought to be enlarged as concerned under bridges. After a short interchange of views, in which the President took an active part, the section agreed on the following:

### Final summary.

« 1° The use of ordinary concrete and « ferro-concrete has found a most extend-

« ed field of applications in all classes of « railway structures. For many works, « reinforced concrete is often a more « economical material than masonry or « steel. Works of this class include particularly bridges, footbridges, water « tanks, buildings, workshops, locomotive « sheds, goods warehouses, and overhung « or veranda roofs for passenger and « goods platforms;

« 2° In the design of a reinforced concrete structure, due care must be taken « of :

« *a*) the characteristic properties of the « material, especially bearing in mind the « effects of temperature and the contraction of concrete during the setting;

« *b*) the methods adopted in carrying « out the work on the site;

« The drawings should be carefully « prepared, particularly the details of the « joints of the bars, which should be « shown in such a manner as to readily « make clear what is intended. Works « in reinforced concrete require constant « supervision by competent technical men « on the site who have had the necessary « practical experience. Special care should « be taken in the choice of suitable materials, and close supervision should be « exercised to see that the dimensions and « positions of the bars are correct, and « that too much moisture is not employed. The concrete should be well rammed at every stage of its construction;

« 3° When properly designed, with suitable materials, the cost of maintenance « of reinforced concrete is sometimes « almost negligeable; more often than not « it is less than that of masonry or « brickwork, and considerably less than « that of steelwork;

« 4° For railway bridges, which are subject to dynamic forces, there appears to « be no technical reason against the use « of reinforced concrete, which can frequently be used advantageously, but « requires very close supervision in its « execution. It is always advantageous « to lay a bed of ballast or an elastic layer « of wood between the track and the concrete, and it is necessary that the surface of the superstructure should be « maintained in a thoroughly watertight « condition;

« 5° It would be interesting to follow « the result of the use of «Ciment fondu», « which should prove of distinct value in « several classes of work and which appears to offer exceptional resistance to « the deleterious effect of salt water consequent on the presence of sulphate of « magnesia;

« 6° It is desirable that the results of « trials which are being carried out by « various administrations of the use of « reinforced concrete sleepers should be « recorded.

« The latter may form a valuable adjunct to the supply of wooden sleepers « and in that event form an efficient « check upon their cost. »

— The general meeting ratified this summary at its meeting of 28 April.

THE PRESIDENT delivered the following address :

« Gentlemen,

« We have now arrived at the end of our work in this section. It is not without emotion that I think, remembering as I do the time we have spent so cordially together, building up mutual esteem and confidence in one another, that we must separate. Less than anyone else am I likely to forget the very pleasant time we have passed together, for as I said in my inaugural address, I consider the honour you conferred upon me as the crowning success of my carreer. We may I think all of us congratulate ourselves on the results which we have arrived at, and I sincerely trust that the friendships which have been established here may be kept for many years between us all, as I hope may be the case with regard to myself.

« Perhaps our meeting even more than some other conferences which have been held — called together with great solemnity, and the echoes of which ring through the world — may be even more productive on behalf of the welfare of the whole his career. (*Applause.*)

« The friendships which have sprung up here between the very able delegates of different nations throughout the world will give a solidarity which will not end with the close of the present session of the Congress. A very pleasant task remains for me to offer our sincere thanks to the vice-presidents, Messrs. Barrand and Deyl, who have so ably helped and supported me with the very heavy task with which you entrusted me. My thanks and gratitude are also due to the general secretary Mr. Tronconi, and to the secretaries who have shown such untiring zeal, not only during our sittings, but also during the ours when we devoted ourselves to recreation. (*Applause.*)

« I am very pleased to be able to conclude my occupancy of the Chair, which you have honoured me with, with these sincere thanks. » (*Applause.*)

Mr. BARRAND (*French Government*) said: Gentlemen, I am sure I am speaking on behalf of you all when I tell our President how grateful we are to him for the remarkable, fair, and courteous manner in which he has presided over our discussions; he has been able by his tact to get agreement upon resolutions on which originally there existed difference. I express to him on behalf of you all our heartiest thanks and our sincere good wishes for his career. (*Applause.*)

Mr. GRIERSON, on behalf of his English colleagues, wished to associate himself with what had been said with regard to the manner in which Mr. Bruneel had presided over the debates, and upon the results which had been obtained. He wished to express the gratitude he felt to those who had assisted in the task, which, owing to the discussions having been conducted in several languages, he appreciated was a particularly difficult one. He thanked all the delegates for the good feeling which had prevailed throughout the whole of the discussions, and he trusted it might be his pleasant lot to be with them again at the next Congress. (*Applause.*)

# SECTION II.

## Locomotives and rolling stock.

*President :* George Gibbs.

*Vice-Presidents :* P. Paul-Dubois and J. J. W. Van Loenen Martinet.

*Principal secretary :* F. Stalder.

### QUESTION V.

### Economic production and use of steam on locomotives.

Economic production and use of steam; different systems; results obtained :

*a*) Superheating the steam; compounding;
*b*) Heating the feed-water;
*c*) Special devices; water-tube boilers, etc.

#### Preliminary documents.

1st report (all countries, except those using the English language), by Mr. M. Lacoin. (See English edition of the *Bulletin* of September 1921, p. 1157, or separate issue [with red cover] No. 29.)

2nd report (countries using the English language), by Mr. G. J. Churchward. (See English edition of the *Bulletin* of October 1921, p. 1527, or separate issue [with red cover] No. 36.)

Special reporter : Mr. M. Lacoin. (See English edition of the *Bulletin* of April 1922, p. 653.)

#### Report of the 2nd section.

(See *Daily Journal of the session*, No. 8, p. 4.)

The President proposed to take as the basis of discussion the conclusions put forward by Mr. Lacoin, the special reporter:

*Section « A ». — Paragraph « a ».*

Mr. Van Schouwenburg (*Dutch East Indian Railways*) wished to say that even with slow stopping trains they had obtained good results with locomotives fitted with single return superheater elements in smoke tubes 2 9/16 inches in diameter. It was not difficult to clean out the tubes, probably because wood was the only fuel used for their locomotives.

Mr. Lacoin (*special reporter*) said that on a certain number of the French railways they had done away with the dampers without trouble developing. This also made it easier to clean the smoke tubes.

Mr. Weiss (*Swiss Federal Railways*) stated that on the Swiss Federal Railways they had also abandoned dampers without trouble arising. With locomotives with eight coupled wheels they obtained a steam temperature of 752° F. when running, and 572° F. when shunting.

Sir Henry Fowler (*Midland Railway*) said that they too had dispensed with dampers without difficulties arising.

M. George L. Bourne (*New York Central Railroad*). — In America they had generally retained the dampers. Superheating with small smoke tubes as mentioned by Mr. Van Schouwenburg was not employed. Any fear of the tubes being blocked had not materialised; they were blown out from the firebox end.

Mr. Vallantin (*Paris-Lyons-Mediterranean*) said that his company had locomotives with piston valves and Serve boiler tubes 70 mm. (2 3/4 inches) in diameter. In order not to have to replace the tube plates, they had obtained superheated steam by placing small diameter elements in plain smooth tubes of this diameter (2 3/4 inches). These engines when altered showed an economy of fuel of about 17 to 24 %, and did not give any trouble. The return bends in the small elements were originally placed so as to lie 13 inches from the tube plate at the firebox end; this distance however had been increased to 19 1/2 inches in order to prevent the ends becoming burnt.

Sir Henry Fowler said that his railway had not been troubled with the tubes becoming burnt, and this he attributed to the care taken in manufacture.

Mr. Robinson (*Great Central Railway*) stated that the Great Central Railway had 500 locomotives without dampers and that they gave every satisfaction. Superheaters constructed of small tubes placed in tubes of 75 mm. (3 inches) diameter had been used to overcome trouble arising from cracks in the tube plate between the large tubes. With regard to the burning of the ends of the tubes, this had been overcome by employing an end made of an iron stamping, but trouble had only occurred with oil fired locomotives.

Mr. Kejr (*Czecho-Slovakia State*) gave the results of trials made in Czecho-Slovakia.

Mr. De Vargas (*Northern Railway of Spain*) said that in Spain they had had trouble with superheater smoke tubes with boilers having steel fireboxes, but with copper fireboxes no difficulty had been experienced.

*Section « A ». — Paragraph « b ».*

Mr. Bourne stated that in America they had 42 000 locomotives superheated and 15 000 which were not, but of this latter 40 % would not be altered owing to their age.

Mr. Lacoin proposed that the words « may possibly be advantageous » be superseded by, « may frequently be advantageously carried out ».

Mr. Weiss stated that in Switzerland superheating was first applied in 1905; in 1910 the first locomotive had slide valves replaced by Lentz valves. In 1913 they began to fit up all the balanced slide valve engines as superheaters, the practice being to use forced lubrication, the oil being forced into grooves in the cylinder port faces. The valves are of cast iron or preferably of bronze. Actually a hundred locomotives had been altered.

Mr. Robinson and Sir Henry Fowler said that they had had no difficulty in using ordinary slide valves with superheated steam.

Mr. Van Schouwenburg. — There are two points to consider: Theoretically superheating gives an economy of coal, but if to obtain this it is necessary to alter the boiler and the cylinders, as he thought it was, to get the greatest possible advantage, the question is to ascertain if the alteration still results in a financial economy.

Mr. Weiss. — The Swiss Federal Railways only alter locomotives of recent types.

The economies realised, which amount to 10 to 12 %, pay for the cost of alteration in from a year and a half to two years.

Mr. Bourne. — With slide valves, the difficulty is not only one of lubrication, but arises from the valves becoming deformed. Replacement of cylinders is not absolutely necessary without one wishes to increase the tractive effort; this is not always required. The improvement ought always to result in an increase in the capacity of the boiler.

Mr. Lacoin. — The Eastern Railway of France had carried out trials with slide valves and obtained satisfactory results.

Mr. Stalder (*Swiss Government*) and Mr. Robinson pointed out that the successful use of slide valves had been fully established.

*Section « A ». — Paragraph « c ».*

Mr. Lacoin thought that the discussion ought to be directed to the application of compounding to very powerful locomotives.

Mr. Bourne. — In America compounding is only employed on Mallet locomotives.

Mr. Vallantin did not consider the question of compounding as definitely established. In France, three railways were about to exchange locomotives with a view of carrying out methodical tests.

Sir Henry Fowler said that the Midland Railway had three cylinder compound locomotives using superheated steam.

Mr. Robinson had obtained good results with four cylinder superheated compounds.

Mr. Bréville (*Northern Γailway of France*) had the same experience.

Mr. Weiss. — The results of trials made on the Swiss Federal Railways show that four cylinder superheated compound engines are preferable to superheated simple engines with four equal cylinders. They are also preferable to two cylinder engines when the varying stress on the rails is considered.

Mr. Gresley (*Great Northern Railway*) thought that it was not desirable to apply superheated steam to existing compound engines. In England the use of three cylinder simple expansion engines using superheated steam was increasing.

Mr. Lacoin said he was in a position to state that two cylinder locomotives with simple expansion and superheated steam had a consumption 5 % less than compound superheated locomotives.

Mr. Bourne said that one must not only consider the coal economy, but also the cost of maintenance.

Mr. Bréville pointed out that coal economy is important because the work which the boiler can do limits the power that can be obtained from a locomotive.

A discussion took place on the exact wording which should be used for the summary, in order to make it accord with the views expressed.

*Section « A ». — Paragraph « d ».*

Mr. Bréville suggested that the exact saving that could be obtained by employing superheated steam to simple expansion locomotives should be inserted. This suggestion was approved of and accepted by Mr. Lacoin, who proposed that from 10 to 20 % should be inserted.

No discussion arose on paragraph *e*, and the discussion was commenced on

### *Section « A ». — Paragraph « f ».*

Mr. Van Schouwenburg enquired as to whether experiments carried out without air relief valves fitted at the header had led to element ends burning; he also asked if trials had been made with steam circulating valves only.

Mr. Weiss said that bye-pass valves and air relief valves had been tried on the Swiss Railways, and that now air relief valves are used on high pressure cylinders, and bye-passes on low pressure cylinders.

Mr. Gresley said that the Great Northern used air relief valves only and placed them on the headers. This had been their practice for ten years and had given complete satisfaction.

Mr. Robinson stated that his experience was the same.

Paragraph *g* did not give rise to any discussion and Mr. Lacoin read the new text proposed for section *A*, which was adopted without alteration.

### *Section « B ».*

Mr. Lacoin proposed that in place of the conclusions which he put forward in his report proper, a text should be adopted very similar to that given in the special report.

Sir Henry Fowler and Mr. Robinson thought that not sufficient actual experience was yet available for this to be agreed to.

Mr. Van Schouwenburg asked what had been the difficulty with the pumps.

Mr. Bréville thought that the principle was agreed on, the question being with the apparatus. The staff is favourable to the use of this type of apparatus.

Mr. Gresley. — The pump is preferable from the point of view of economy, but when repairs are taken into account, the exhaust steam injector is the best.

Mr. Boulière (*Greek State Railways*) said that very satisfactory results had been obtained in Greece with feed water heaters, especially with bad waters. The coal economy had been 14.5 %, but he wished to emphasise the importance of preventing scale in the boiler.

Mr. Vallantin. — On the Paris-Lyons-Mediterranean they had also found an economy of 14 % on ten locomotives which had been fitted as an experiment with feed water heaters. This result had decided them to extend the system to a hundred other locomotives. The piping required was easy to fix, and the staff was very satisfied with the apparatus.

Mr. Lacoin and Sir Henry Fowler proposed that the wording should be altered, and that suggested by Sir Henry Fowler was adopted.

### *Section « C ».*

Paragraph *a* did not give rise to any discussions.

With regard to paragraph *b*, Mr. Van Schouwenburg said that on his railway they had experimented with the *Göldsdorf* apparatus. This caused scale to be deposited in the apparatus itself and not in the boiler, and he thought mention should be made of this apparatus in the summary.

Sir Henry Fowler pointed out that apparatus of this type is only of use where scale is due to « temporary » hardness of the water, and not when it is due to « permanent » hardness.

Mr. Lacoin had used the method of feeding the water into the boiler by which the deposit collects on two plates placed in the steam space. This apparatus gives good results, but entails a certain amount of trouble in removing the mud when the water is bad.

Mr. Crawford (*United States Government*) said that washing out with hot water is general in North America, where it is also the practice to soften the water.

Mr. Bréville stated that trials with washing out with hot water had been made in eight sheds of the Northern Railway of France. The installations were similar to those put into service in Italy in October 1921 and have given very satisfactory results, especially from the point of view of quickness in washing out and time saved in raising steam again.

Mr. Casinelli (*Italian State Railway*) spoke of the favourable results obtained at the locomotive sheds at San Lorenzo with the method of washing out with hot water and recuperating the heat. He gave figures showing the economy realised, and pointed out that the tube plates were kept in a better state of repair.

Mr. Lacoin. — The principle of the advantage of washing out with hot water is not disputed. What one wants to know is where one can use as a practical proposition the heat recuperated from the steam and the water emptied out; the plant that allows of this being done is very expensive. Without doubt recuperation is of greater interest where locomotives are pooled.

Mr. Weiss. — The Swiss Railways have a plant at Zurich. He thought that the practice in America is chiefly justified by the use of steel fireboxes.

Mr. Gresley. — The Great Northern put in their first installation in 1910. The results have been so satisfactory that they have equipped two other sheds at each of which 200 locomotives are stationed. The chief advantage is that greater use can be obtained from the locomotives.

The President proposed that the text of the special reporter be adopted. The concluding paragraph *c* did not give rise to any discussion.

The summary of this question, which it was decided should be put forward to the general meeting, was as follows:

### Final summary.

« Section *A*. — SUPERHEATER STEAM.

« *a*) Superheating is universally adopt-
« ed in the construction of locomotives
« for passenger and freight trains. It
« has not yet been exclusively applied to
« suburban traffic, but the results given
« in these services have been satisfactory,
« especially when the smokebox dampers,
« which cut off superheating when the
« regulator is closed, are removed.

« *b*) The conversion of saturated to su-
« perheated steam engines may frequent-
« ly be advantageously carried out when
« these are in the shops for repairs,
« especially with powerful engines of
« recent types.

« *c*) Owing to the superheat, the use of
« two cylinder single expansion and su-
« perheater locomotives has increased.
« For powerful engines the preferences
« of the railways are divided between two

« cylinder single expansion, the four cyl« inder compound and the three or four « cylinder single expansion all with su« perheaters.

« *d*) The fuel economy obtained by the « application of superheat to the single « expansion engines may be estimated on « the average to be for ordinary work« ing conditions about 10 to 20 %. This « economy however varies considerably, « according to the work done and the « condition in which the parts are kept, « and it is necessary to pay more atten« tion to upkeep than with saturated « steam engines.

« *e*) The special arrangements adopted « originally for the valves and pistons of « superheat engines have a tendency to « become more uniform, simpler and « more like those used on saturated steam « locomotives. On new locomotives pis« ton valves are exclusively used for the « high pressure cylinder and packings « with sliding joints and outside air cool« ing for rods acted on by live steam. « The area of the cylinder relief valves « has also been increased. These are the « only special arrangements, the neces« sity for which has been universally re« cognised.

« The same tendency towards simplifi« cation is apparent in the instructions « given to the drivers.

« *f*) Some administrations use both air « relief valves and bye-passes. The ne« cessity for both of these does not ap« pear to be yet completely established.

« *g*) Corliss and similar type valves and « the uniflow arrangement have made no « progress.

« SECTION *B*. — FEED WATER HEATER.

« Some railways have introduced feed « water heaters and exhaust steam injec« tors on a large scale.

« The results which have been obtained « justify the extension of the use of these « devices.

« SECTION *C*. — VARIOUS DEVICES.

« *a*) The trial of water tube boilers in « competition with those of ordinary type « has made no progress. Those made up « to date have not enabled any definite « conclusions to be arrived at. Even in « the most favourable cases the advant« ages found, or anticipated, in coal con« sumption or cost of maintenance ap« pear to be small.

« *b*) There is an advantage in washing « out boilers with hot water, particularly « when it is necessary that they should « be stopped for as short a time as pos« sible. These washing out plants with « auxiliary boiler and fixed water and « steam piping allowing the recuperation « of the steam and water for locomotives « are used to advantage in certain parti« cular cases, especially where the cost « of water is very high, but their price « and complication seem to be against « their extensive use on systems where « the engines have fixed bookings.

« *c*) Brick arches improve combustion, « and their use has become general. »

The general meeting ratified this summary at its meeting of 27 April.

## QUESTION VI.

### Bogies (trucks), axles and springs of locomotives.

Best arrangement of the bogies, axles and springs of locomotives, especially of locomotives for high speeds, with long wheelbases, so as to facilitate running round curves and to ensure the proper stability of the engines.

### Preliminary documents.

1st report (Belgium, Denmark, Norway and Sweden), by Mr. E. MINSART. (See English edition of the *Bulletin* of December 1921, p. 2039, or separate issue [with red cover] No. 46.)

2nd report (all countries, except those using the English language, Belgium, Denmark, Sweden and Norway), by Mr. BOCHET. (See English edition of the *Bulletin* of January 1922, p. 193, or separate issue [with red cover] No. 55.)

3rd report (Countries using the English language), by Mr. G. HUGHES. (See English edition of the *Bulletin* of October 1921, p. 1589, or separate issue [with red cover] No. 38.)

Special reporter: Mr. G. HUGHES. (See English edition of the *Bulletin* of April 1922, p. 658.)

### Report of the 2nd section.

(See *Daily Journal of the session*, Nos. 4-5, p. 5.)

Mr. HUGHES (*special reporter*) gave a summary of the three reports which had been submitted to the Congress on this question, and briefly called the attention of the section to the different types of bogies, the methods of suspension and position of the springs.

At the end of his summary he showed three interesting photographs of a 60 t. locomotive which had been suspended for the experimental determination of the position of the centre of gravity. The calculated height of this was 4 ft. 10 in. and the height found experimentally was 4 ft. 11 7/8 in.

Mr. BOCHET (*reporter*) pointed out how difficult it was to put forward definite conclusions. It appeared to him that they were concerned with two types of bogies, the «American» and the «French» which Mr. Bochet called the « Alsatian » owing to it having first been brought out by the « Société Alsacienne de constructions mécaniques ». The Americans gave the greatest possible flexibility to their bogies in order to facilitate the entrance to curves. The French on the other hand aimed at obtaining a very steady engine during running both on curves and on the straight. They give their bogies a more rigid bearing and require a greater variation of the road to cause oscillation.

With regard to the suspension of the locomotive proper, he pointed out the differences between separate springs for each wheel and the use of compensating levers joining up to the springs. In the latter case one can always depend upon an equal distribution of the weight between the axles by means of the compensating levers, whilst in the former, the engine is steadier and more easily repaired.

With regard to the case of the breakdown of a spring, he agrees with Mr. Hughes that the use of independent springs is the less dangerous since the failure remains local.

Mr. MINSART (*reporter*) stated that on the Belgian State Railways they used bogies with a central spherical bearing on a plate suspended by triangular links. In his opinion this type was preferable, it had given every satisfaction from the point of view of steadiness, especially on four cylinder compound locomotives with six wheels coupled and with a bogie in front, as had recently been put in service on the Belgian State Railways.

With regard to the use of compensating levers, Mr. Minsart stated that they had never observed any inconvenience from their use on the Belgian State Railways; they were convenient in overcoming the difficulties of proportioning the load between the springs.

Mr. Minsart also said that the formula given by Mr. Hughes for the calculation of the length of the tail piece of the bissel truck was the same as that given by Mr. Bochet. If one in the first place determines the curvature which should be given to the radial axle boxes, this gives the distance of the centre from the axle.

Mr. Gresley (*Great Northern Railway*) said that on his railroad he employed bogies with suspension links, but he had discontinued the use of the central flat bearing and now used spherical bearings.

He also used bissel trucks with a double set of links giving an equal distribution of weight on the two wheels.

With regard to special steels, he said that he used chrome nickel steel (tensile strength 50 t. per square inch with 18 % elongation) for connecting and coupling rods, and was able to reduce their weight by one third. With the same object he used hollow piston rods.

With regard to the balance of the reciprocating parts, he allowed for 60 % of the weight of these and the running of the locomotive is very steady up to 80 miles per hour, and had resulted in much less wear of the tyres and rails.

Mr. Bochet thought that it is a difficult matter to establish absolute rules for the proportion of the weight of the reciprocating parts to be balanced. One in practice is forced to try and « strike a happy mean » : if the percentage is too low excessive horizontal disturbances result, whilst if on the other hand the percentage is too high there is the risk that the vertical disturbances set up may result in hammer blows on the rail. In fact the proportion has to be left to the discretion of the designers. The percentage taken varies not only with the country, but from one company to another in the same country. The practice of the Italian State Railway has been to adopt a proportion of 15 % and this leads to balancing 30 % of the reciprocating parts.

With regard to the question of the initial centreing effect for bogies Mr. Bochet stated that the absence of this increased the ease of movement of the bogie. Such is the case when links and rods are employed, but the guidance of the bogie is then less correct.

With initial centreing effect the running is steadier, naturally, both on the straight and on curves. The ease of movement of the bogie is particularly necessary on sinuous roads. In the case of main lines with long straight runs and with easy curves it is desirable to allow the bogie less freedom.

The Italian State Railway use two methods of centreing, namely, by links and by springs, in order to obtain steadier running.

In the case where initial centreing is obtained by means of springs, one ought to have a definite rule as to the value of the centreing force. Mr. Bochet suggested the idea of making this force vary, by means of a device which has not yet been put into practice.

Sir Henry Fowler (*Midland Railway*) stated that on his railway many locomotives are fitted with bogie brakes which acted satisfactorily. He asked if the delegates of other countries could give any information as to the super-elevation of the rail on entering a curve and also on the subject of the thinning of the flanges of the middle wheel tyres.

He also asked as to the effect on the

wear of tyres when lubrication had been applied to the flanges.

Mr. Bochet thought that the braking of bogies did not cause any danger if the percentage of the weight braked was limited, this would also prevent the possibility of any grave accident which might occur if the bogie wheels skidded and mounted the rails. He would like to know if under these conditions the braking of the bogie wheels was still of interest to the delegates and whether the actual advantages in working made up for the extra expense entailed. This was the point which really settled the question.

He called attention to the fact that he had given in table VI of his report (column 27) various formulæ used for calculating super-elevation. In order that a curve may be entered easily, the super-elevation should gradually increase from *o* on the tangent to the full value given in table VI. This joining up ought to follow a law of the second degree (transition curve) or even of the third degree without causing any practical trouble. The essential point is that the deviation in direction should lead away as gradually as possible.

Mr. Maunsell (*South Eastern & Chatham Railway*) said that on his railway they had had in service during the last six years bogies with moving links with centreing by means of inclined planes, and he was quite satisfied with these.

Mr. Collett (*Great Western Railway*) agreed that it was desirable to brake the bogie wheels. On the railway he was connected with the results with swing link suspension had not been successful, they had also tried simple double suspension with link inclined each way, but had found it better practice to use horizontal slides.

With regard to special steels, the Great Western had used chrome steels, vanadium steels and nickel chrome steels, but these were not successful without being heat treated at an absolutely definite temperature. Now they were provided with furnaces fitted with pyrometers and obtained material in a perfectly correct state and did not experience any trouble.

Mr. Weiss (*Swiss Federal Railways*) said that in Switzerland they had about 200 locomotives both steam and electric which were fitted with bogie brakes. This practice commenced in Switzerland in 1896 and it is now actually required that the bogie wheels be braked of engines the speed of which exceeded 46 1/2 miles per hour. The amount of the weight on the rails braked is fixed at from 50 to 60 %. It is judged necessary to take these steps because the locomotives are sometimes required to run light.

No one else wishing to take part in the discussion on this question, it was closed by the President.

The President proposed that the summary which had been drafted by the three reporters be read, and this was done in French, English and Italian by Messrs. Bochet, Hughes and Parodi (Paris-Orleans Railway).

The President thanked these gentlemen for the trouble they had taken in the matter, and proposed that this summary should be approved without discussion. This was agreed to and the following summary was referred to the General meeting.

### Final summary.

« Notwithstanding the long wheel bases « of large powerful modern locomotives

« it is generally possible, under normal « conditions, to construct locomotives ca- « pable of moving through curves of « small radius without making articulated « frames.

« The means generally used to facilitate « the passage round the curves are, for « the front axles, bogies or bissels trucks, « for the rear axles, bogies or bissels or « axles with side play.

« It may be said that the bogie has « mainly become the necessary accessory « of all locomotives which are intended « to run at high speeds with heavy trains.

« When the rear axle is a coupled axle, « sometimes side play is given, but ge- « nerally the tendency is not to give it « side play, but to thin the tyres of the « intermediate axles.

« Bissel bogies are not used sufficiently « to enable a conclusion to be arrived at. « The construction of bissel bogies might « be improved by simplification, which « appears possible in certain cases. The « length of the radial arm should be cal- « culated in such a manner that the axles « remain normal to the track, and the « same applies to the radius of the radial « axle boxes which are sometimes used.

« The method of supporting the weight « of the locomotive on the bogie or bissel « is either central or lateral, and the « system of centreing by springs or gra- « vity with or without initial centreing « force. Opinions differ regarding which « is the best method, but no definite sta- « tement can be made. It appears that « the devices which give the front axles « lateral freedom about their central po- « sition are to be recommended in the « case of light track with many curves.

« Generally it is not the practice to « give the front bogie and at the same « time the rear carrying axle great free- « dom: For the suspension of the driv- « ers and coupled wheels, laminated « springs are in general use, and perhaps « are the best, as the friction between the « plates has a damping action which re- « duces the amplitude and duration of « the vibrations and oscillations.

« With regard to compensating levers, « no new facts have emerged which would « alter the conclusions arrived at in 1900.

« In calculating the weights which are « intended to balance the reciprocating « parts, it is essential to ensure that the « total load including the dynamic incre- « ment is well within the carrying capa- « city of the track from the point of view « of maintenance. »

The general meeting ratified this summary at its meeting on 26 April.

## QUESTION VII.

### Passenger carriages.

Improvements to be made in the design of carriages and rules to be observed in the make-up of trains, so as to increase the safety and comfort of passengers.

**Preliminary documents.**

1st report (America), by Mr. B. F. Bush. (See English edition of the *Bulletin* of September-October 1914, p. 839, or separate issue [with red cover] No. 3.)

2nd report (Spain, Portugal and countries using the same language), by Mr. F. de Vargas. (See English edition of the *Bulletin* of May 1921, p. 461, or separate issue [with red cover] No. 15.)

3rd report (America), by Mr. W. J. Tollerton. (See English edition of the *Bulletin* of October 1921, p. 1399, or separate issue [with red cover] No. 33.)

4th report (all countries except Spain, Portugal and countries using the same language, Great Britain and America), by Mr. E. BIARD. (See English edition of the *Bulletin* of September 1921, p. 1205, or separate issue [with red cover] No. 30.)

5th report (Great Britain, India, Australasia and South Africa), by Mr. R. W. REID. (See English edition of the *Bulletin* of November 1921, p. 1859, or separate issue [with red cover] No. 43.)

Special reporter: Mr. E. BIARD. (See English edition of the *Bulletin* of April 1922, p. 662.)

### Report of the 2nd section.

(See *Daily Journal of the session*, No. 8, p. 5 and No. 9, p. 8.)

Mr. BIARD (*special reporter*) read the general conclusions of his special report.

THE PRESIDENT said it would be inconvenient to discuss these conclusions one by one, the section could, however, by means of a general discussion examine some of the more important items, and he proposed that they should commence with steel cars. On the New York Metropolitan, steel cars had been used for several reasons, the principal being the desire to render them fireproof and the presence of electrical equipment. On the Pennsylvania Railroad, the chief point for their use was the fact that access to the station was obtained through a long tunnel. The New York Central were faced with the same problem.

Mr. BIARD was in agreement with the suggestion and thought that they should adopt for their final summary the scheme laid out by the reporters.

Mr. REID (*reporter*) said that in England what they did in connection with steel vehicles was limited by the loading gauge and the weight per axle. The introduction of steel vehicles would increase the weight to be hauled per passenger. It should be pointed out that side doors and corridors are now regularly adopted for new stock in England. In that country it is considered better to look for safety by the improvement of signals than by building carriages better able to resist damage in the case of derailment and accident.

Mr. TOLLERTON (*reporter*) remarked that in America journeys are often of great length, and the provision of greater comfort is looked upon as of more importance than the trouble arising from an increase of weight. The repair of steel built vehicles is much easier than those built of wood, rarely more than repainting is required.

Mr. VAN SCHOUWENBURG (*Dutch East Indian Railways*) said that the construction of American vehicles required to be of a more robust character because of the central coupling and the blow required to operate this.

Mr. VAN LOENEN MARTINET (*Dutch State*). — In Holland they were proposing to employ of steel for two reasons: 1° because of the much greater strength with equal weight; and 2° because of the greater ease in repair.

THE PRESIDENT. — Steel vehicles are not necessarily much heavier than wood, perhaps 10 %. He gave figures with regard to the weight of American vehicles per passenger.

Mr. REID. — The figures just given by the President confirm his opinion that the steel vehicles are considerably heavier. In Europe they were generally limited to making the panels of steel. In suburban services the weight of the vehicles having a steel underframe and wooden body amounted to 600 lb. per seat, while with steel it reached 900 lb., and if it was required to give a greater strength with a view to collisions, on the lines of the United States practice, the weight per passenger reached 1 400 lb.

THE PRESIDENT. — In America one reaches these weights with wooden vehicles.

Mr. COOPER (*City & South London Railway*) said that on the London Metropolitan District (partly under ground and partly suburban) which had all metal vehicles, it was found that these were not wholly a success. As far as noise, cold and appearance were concerned, they were less satisfactory than the other type. The tendency in England was to use steel for the underframe and for the framing of the body, using a certain amount of wood in the body proper; this was partly on account of it being cheaper than all metal construction.

THE PRESIDENT requested the reporters to come to an agreement on paragraphs 18 and 19 (steel vehicles).

THE PRESIDENT proposed that the question of lighting and heating be now dealt with.

### DISCUSSION ON SECTION *E*.

Mr. REID asked what was the policy on the continent with regard to lighting by gas or electricity, and in the latter case, which system was preferred (a dynamo for each coach or the lighting of two or more carriages by a somewhat larger equipment).

Mr. BIARD, — In France lighting by gas had been the rule; electricity cost nearly double. In consequence of the accident in the Batignolles tunnel, the Government had now insisted on the installation of electric lighting. The system adopted is that of a dynamo on each vehicle.

Mr. VAN LOENEN MARTINET. — Electric lighting of coaches in Holland began in 1910 with a dynamo per vehicle. The cost per vehicle was a little less than double that of gas lighting, but one was now able to get a certain economy by using a single battery and more economical electric lamps.

Mr. TOLLERTON. — In America electric light costs half that of gas.

Mr. GLOVER (*Great Northern Railway of Ireland*). — All the vehicles on his railway are electrically lighted for reasons of comfort. To attend to the electric lighting of 600 coaches the only required eighteen men. The batteries had a life of nine years and only required renewing after running 90 000 miles.

Colonel PRINGLE (*British Government*) said he was in favour of electric lighting, which he thought was safer, and he said the British authorities are pleased to be able to state that the railways have commenced changing over gas lighting to electric lighting.

Mr. JACQMIN (*Belgian State Railway*). — The Belgian State Railway only employ equipment with dynamos on each coach. The system with which there is one dynamo on the locomotive has been abandoned.

THE PRESIDENT asked the reporters to draw up the final text for paragraphs 29 and 30 (lighting). He then raised the question of heating for discussion.

Mr. BARNET LYON (*Dutch Government*) raised the question of the heating of trains on electrified lines.

Mr. Glover said that as the results of tests he had found that it was not possible to heat a coach by means of a dynamo driven from an axle.

Mr. Van Loenen Martinet thought that this matter really belonged to the question of electric traction and wished to leave out the paragraph relating to heating by steam from the locomotive.

Mr. Biard insisted on keeping this paragraph in; the system was in general use, in France particularly so.

The President passed to the discussion of the conclusions regarding brakes.

Mr. Reid said that this subject was so large a one that he proposed it be not discussed.

The President approved of this and the section agreed with this conclusion.

The President opened the discussion on sections *B* and *D*.

Mr. Süss (*Madrid-Saragossa-Alicante Railway*) proposed that alarm buttons should be placed in each of the four corners of the compartments as the alarm gear at present used is too high. He suggested that the text of the summary should be altered accordingly.

Mr. Duchatel (*Eastern Railway of France*) remarked that this system had already been tried in France and abandoned because of the improper use made of it and because it was not efficient.

Colonel Pringle agreed with this view.

Mr. Süss pressed that a note should be made stating that a better type of alarm signal was desirable.

The President asked the reporters to draw up jointly a text for paragraphs 18, 19, 27, 29 and 30.

At the afternoon meeting, Mr. Biard read the new summary on questions dealing with metal vehicles (Nos. 18 and 19), lighting (29 and 30), heating (31 and 32) and brakes (No. 33). These proposals were adopted without discussion.

Mr. Gibbs did not take the chair, which was occupied by Mr. Van Loenen Martinet, vice-president.

The President opened the discussion on section *A*.

Mr. Gresley (*Great Northern Railway*) supplied information as to the twin carriages used in his railway.

Mr. Biard said that the Paris-Orleans Railway also had twin vehicles which enabled them to utilise old coach bodies.

Mr. Duchatel criticised the arrangement, pointing out the inconvenience which arose in case of derailment or accident.

Mr. Gresley stated that on the Great Northern Railway the system also originated from a desire to utilise old bodies. The results of trials however were such that the method of construction had been adopted for new coaches. The objections raised by Mr. Duchatel are not applicable, because in England the composition is the same as with other trains and hot boxes are extremely rare.

Mr. Kirkhope (*Oud & Rohilkhand Railway, British India*) asked for information concerning the construction of this type of vehicle.

Mr. Gresley said the underframes were strengthened by the use of four tie rods in place of two, but this additional weight was more than compensated for by the saving in buffers and couplings.

Mr. Biard found the system interesting, but only applicable to special cases, and did not think that the Congress could take it into consideration because it did not directly influence safety or comfort.

Mr. Gresley said that after the experience he had had, he thought that the articulated train gave greater safety. Continental practice was not the same as in England, where a train was made up of several articulated coaches.

The President suggested that the reporters should put forward a shortened text for section *A*.

Dealing with section *B*, the president asked if any member had observations to make, and as no one had any remark, he asked the reporters to agree on a text between them.

The same procedure was taken with regard to section *D*.

With regard to section *F*, Mr. Bochet (*French Government*) considered that there might be a misunderstanding because of the use of the word « homogeneity » in paragraph 34, and proposed that the paragraph be deleted.

Messrs. Biard and Reid agreed to this and the text of section *F*, as modified, was adopted.

Mr. Biard read the following summary, which was approved by the section without discussion.

### Final summary.

« 1° The comfort and safety of the passenger, as well as economy in first cost « and maintenance, have been the determining factors in the design and construction of the passenger carriages of « the railway administrations of all countries.

« A. — *General arrangement of carriages.*

« 2° The bogie type of carriage is used « exclusively in America. Its use is increasing in other countries and tends « to become general for express and long « distance train service.

« 3° The four-wheeled bogie is usually « considered adequate, so long as the « weight carried is not so great that the « six-wheeled bogie becomes necessary.

« In England experiments have been « made on articulated trains, one bogie « being common to two carriages.

« B. — *Internal arrangement of carriage bodies.*

« 4° Vestibule coaches with through « connections are exclusively used in the « U. S. A.; there is a tendency for this system to extend to other countries for « long distance trains.

« On many trains, however, coaches « with side doors and corridors, in some « cases communicating throughout the « train are used.

« C. — *Type of construction.*

« 5° The use of all metal or nearly all « metal carriages has developed rapidly « in North America. This method of « construction is now generally adopted « there and is considered to reduce to a « minimum the risks attendant on derailments, collisions and fire.

« In Europe metal construction has not « been applied to any appreciable extent, « except in the case of electrified lines. « On certain lines, however, steel construction is being considered with a « view of reducing fire risk; it is not « intended, however, to approach the « weights of the American coaches which « have been partly incurred owing to ad-

« ditional comfort provided for passengers.

« D. — *Details of carriage fittings.*

« 6° The comfort provided in modern « carriages is mainly due to the methods « adopted for the distribution and division of the compartments, to the increase « of air space and to the area allowed per « seat, to the upholstery of the seats, to « the ventilation, to the internal decoration, and to the numerous improvements that have been introduced in the « smallest details.

7° It has not been found that the use of « either of the two types of coaches, *i.e.*, « side door or corridor had any effect on « the frequency of criminal attacks. »

« The most effective method is to arrange alarm gear within reach of the « passengers, and easily accessible, for « warning the train staff or operating « the brakes. The general tendency is to « allow the passengers to effect the stoppage of the train rather than merely « slowing the speed.

« Small windows in the partitions between carriages (*glaces dormantes*) are « also required in various countries.

« E. — *Various appliances.*

« 8° *Lighting.* — Notwithstanding the « safety devices introduced, gas is now, « in some countries, considered to be dangerous and to be liable, if not to cause, « at least to increase fire following on « collision. Electricity, particularly for « this reason, tends to replace gas completely.

« 9° *Heating.* — The method of heating « by steam from the locomotive is becoming more and more widespread. Recent improvements have been made with « the object of better ensuring the flow « of the steam to the last carriages of the « longest trains, and to allow of the regulation of heat in the carriages or in the « compartments.

« 10° *Brakes.* — The use of continuous « quick acting brakes has been extended « on nearly all the railway systems: trials « have been carried out to increase the « rapidity of action and effectiveness of « the brakes on trains which run at very « high speeds, and which have become of « increased length and increased weight.

F. — *Make up of trains.*

« 11° Safety in running is considered « as ensured if each of the vehicles, taken « singly, is capable, by reason of its « weight per axle and its wheel base, of « travelling at the maximum speed of the « train.

« Owing to this, nearly all railway systems insist on either a minimum wheel « base or a minimum weight for all vehicles that are to be made up into fast « trains. Some administrations, in addition, require the grouping in a certain « order, or in a definite position in the « train, of those carriages which do not « conform to the conditions laid down for « weight and wheel base.

« 12° Other rules have been laid down « regarding the interposition of buffer « carriages at the front and rear of trains, « the maximum number of carriages or « axles per train according to the speed, « the gradient, and the type of engine.

« 13° It is desirable that improvements « and the application of such improvements may continue to be carried out « as far as the increased financial burden « due to these remains proportionate to « the end to be attained and compatible

« with the economic position of each administration or of each country. »

— The general meeting ratified this summary at its meeting of 28 April.

## QUESTION VIII.

### Electric traction.

Electric traction on lines with dense traffic: production and transmission of energy; type of current; locomotives, motor cars. Technical and financial results obtained. Comparison with the results of steam traction.

#### Preliminary documents.

1st report (Switzerland), by Mr. E. Huber. (See English edition of the *Bulletin* of October 1921, p. 1357, or separate issue [with red cover] No. 32.)

2nd report (Sweden, Norway and Denmark), by Mr. I. Öfverholm. (See English edition of the *Bulletin* of November 1921, p. 1934, or separate issue [with red cover] No. 44.)

3rd report (Italy), by Mr. A. Donati. (See English edition of the *Bulletin* of December 1921, p. 2175, or separate issue [with red cover] No. 48.)

4th report (Holland and Great Britain), by Mr. J. J. W. van Loenen Martinet. (See English edition of the *Bulletin* of October 1921, p. 1441, or separate issue [with red cover] No. 32.)

5th report (America), by Mr. G. Gibbs. (See English edition of the *Bulletin* of December 1921, p. 2091, or separate issue [with red cover] No. 47.)

6th report (all countries, except Holland, Great Britain, Belgium, Denmark, Norway, Sweden, Italy, Switzerland and America), by Mr. Sabouret. (See English edition of the *Bulletin* of January 1922, p. 107, or separate issue [with red cover] No. 52.)

7th report (Belgium), by Mr. E. Gerard. (See English edition of the *Bulletin* of May-June 1922, p. 763, or separate issue [with red cover] No. 64.)

Special reporter : Mr. E. Gerard. (See English edition of the *Bulletin* of April 1922, p. 731.)

#### Report of the 2nd section.

(See *Daily Journal of the session,* No. 6, p. 10, No. 7, p. 9 and No. 8, p. 7.)

Mr. Ernest Gerard (*special reporter*) read the final part of his report. He pointed out that the questionnaire was not restrictive, but intended to state the issue in plain terms.

The President suggested and the section agreed to take Mr. Gerard's summary in paragraphs.

*Paragraphs 1, 2 and 3: Type of current.*

Mr. Semenza (*Italian Government*) regretted that the suggested summary did not lay stress on the necessity of studying the various economical and technical points of the systems in order to assist in the selection of the most suitable one.

Mr. Gerard recalled the discussion at the Congress at Berne in 1910, which showed the interest which should attend on discussion of the proposed text.

Mr. Huber (*reporter*) and Sir Philip Dawson (*London, Brighton & South Coast Railway*) stated they could agree with the proposed text: they were of opinion that the selection of the system depended on so large a number of factors that it was practically impossible to lay down any hard and fast rules.

Mr. Sabouret (*reporter*) was of quite a different opinion, and mentioned that in France they had been able to adopt a universal system and pointed out the resulting advantages.

Mr. Sayers (*Great Central & Midland Railway*) called attention to the inductive effects of the traction lines on telegraph and telephone lines. On British Railways these effects have probably been the determining factor in the selection of the direct current system by the Government Electrification Advisory Committee, other advantages and disadvantages in systems being about equal.

Mr. Huber said that it was a good thing if the telegraph and telephone authorities could move their wires from the neighbourhood of the traction lines; in some cases however this could not be done. In Switzerland therefore the possibility of moving the wires had not been the determining factor in the selection of the system to be employed.

Mr. Sabouret proposed that a modification to the end of paragraph 1 be discussed.

The President would have liked to have had a text more positive than that proposed by Mr. Gerard expressing more clearly the ideas of the delegates; he would prefer a wording stating categorically that none of the systems can be considered as a standard one, applicable to all cases.

Mr. Sabouret spoke of the desirability on a large railway, which was run partly by hydro-electric installations and partly by steam driven plants, of connecting the generating stations together. He mentioned the Paris-Orleans as an example of this.

Sir Philip Dawson pointed out that in his opinion paragraph 3 only examplifies paragraph 1.

Mr. Lanino (*Italian Government*) supported the wording proposed by Mr. Gerard, and defended the different methods of electrification adopted by the Italian State. In his opinion the most important thing was the standardisation of coupling and draw gear so as to prevent unnecessary trouble in shunting, etc., at frontier stations.

*Paragraph 4 : Records and statistics.*

Mr. Duer (*Pennsylvania Railroad*) considered that the standardisation of the records for international account keeping was difficult, because it is frequently impossible to separate entirely the electrified from the non-electrified parts of the railway.

Sir Henry Fowler (*Midland Railway*) stated that in his opinion it was almost impossible to give figures for the « virtual ton-kilometre » which would have any practical value.

Mr. Parodi (*Paris-Orleans*) agreed with Sir Henry Fowler and pointed out that the tractive force required per ton varied with the varying total weight of the vehicles.

Mr. Huber pointed out that it was a matter of great interest to arrive at an understanding with regard to the method of calculating the virtual ton-kilometre and determining the amount of energy used for traction.

Mr. Semenza was in agreement with Mr. Huber, but thought that the definition of virtual ton-kilometre or virtual length adopted with steam traction need not of necessity be agreed to for electric traction.

Mr. Lanino spoke on the advantages which would accrue from an agreement on the subject of standardising the definition of the fundamental units on railways. This work ought to be delegated by the present Congress to an International committee on which all sections ought to be represented.

Sir Henry Fowler moved that in the place of paragraph 4 a fresh one he had drawn up should be adopted, and the proposal was carried. (The new wording is given in the summary and is there numbered three.)

*Paragraph 5 : Overhead conductors.*

Mr. Pattison (*Illinois Central Railroad*) said that from his experience it was desirable to duplicate the contact wire on main lines with heavy traffic if the voltage was 3 000 or less.

Sir Philip Dawson gave some very interesting information about the wear of the contact wires on his company's lines. He said it was negligible at points where there was no consumption of current and where there were no steam locomotives running. Abnormal wear had been avoided by the prevention of hard points, and generally speaking he could say the wear is more than proportional to the current collected.

Mr. Van Loenen Martinet (*reporter*) wished to know the recent results given by the working conductor of the Chicago, Milwaukee & St. Paul Railroad.

Mr. Semenza said that he had visited that installation in the summer of 1921 and that the double contact line had behaved extremely well, both as regards absence of sparking and wear and tear.

Replying to a question of Sir Philip Dawson, Mr. Semenza stated that owing to the industrial crisis the number of trains had been reduced to about twelve per day.

Mr. Öfverholm (*reporter*) stated that with a catenary system in which the suspension points of the contact wire were spaced 19 yards (17 m.), the collecting of the small current required by a 11 000 volt system caused no trouble.

Mr. Parodi said that there was practically no wear on the wires of the Nord-Sud (Paris) Railway, where the voltage was 600 and the current usually collected 1 000 amperes.

Mr. Donati (*reporter*) said that after the long experience which had been obtained on the Valteline line, entire satisfaction had been given on that line by the installation of transverse suspension. He stated that on a three-phase line in the vicinity of Turin the delays due to the contact wire were but 80 minutes per month out of 2 080 minutes total delay.

Mr. Lanino spoke of how difficult it was to separate the question of the type of suspension from that of the choice of type of current. In Italy, in the majority of cases, the cost of the contact line is a secondary consideration. In other countries where heavy gradients and sharp curves are rare and the distances great, other considerations prevailed, and these considerations ought not only to influence the type of contact line employed, but equally the choice of system.

Mr. Sayers stated that his company had experimented for fifteen years largely with the object of obtaining an overhead contact wire free from hard points, and the result of this experience was entirely in favour of catenary suspension; in fact to avoid vertical inertia necessarily associated with pull-offs he had devised a system which dispensed entirely with separate pull-offs, in which every dropper was a pull-off, and this had run with great success.

He suggested that the question as to whether transverse or catenary suspension was more desirable depended on the speed of the traffic and the quantity of current to be collected.

THE PRESIDENT supported Mr. Sayers' view, and was of opinion that no other system than the catenary could be satisfactory for the railway with a heavy traffic and fast trains.

Mr. DONATI pointed out that on the three-phase Italian lines simple transverse suspension gave excellent results, even for speeds up to 100 km. (62 miles) per hour.

*Paragraph 6: Utilisation of same current distributing scheme for rail traction and industrial uses.*

Mr. GERARD pointed out that this was of great interest in countries where a single system of supply must be applied for all purposes.

Mr. LANINO mentioned instances of the use, in Italy, of high frequencies for traction purposes.

Mr. HUBER insisted that difficulties must arise in endeavouring to connect, either directly or by means of transformers, industrial and traction supplies from the same source of power owing to the troubles caused by the sudden heavy demands for current by the traction lines.

Mr. PARODI stated that when on a visit to the installations of the « Société des forces motrices bernoises » which supplied current to the three-phase line from Berthoud to Thun, he had not ascertained that any such difficulty existed.

Mr. DONATI thought that there was some hope of overcoming these difficulties by means of voltage regulators of modern design and by regulators governing the turbines.

Mr. LANINO concluded the discussion of this paragraph; he showed that the problem of connecting the traction line with the industrial one must receive a solution in countries little developed industrially, like Southern Italy, and that, on the other hand, the same problem was of secondary interest in the countries having great industrial development.

*Paragraph 8: Multi-traction.*

Mr. SABOURET (*reporter*) wished to know why single-phase current has been abandoned on the Norfolk & Western Railway in favour of the split-phase system.

THE PRESIDENT explained the chief reasons for the choice that was made. In the first place the length of the trains caused very great difficulties in starting the locomotives simultaneously, with the result that a heavy current passed through the motors whilst standing. In addition to this, the importance of the gradients and the necessity of recuperation had to be considered. The general conditions of the line, especially of one tunnel in the section, made it impossible to put up two overhead conductors for direct collection to the three-phase motors; hence the necessity for collecting from a single-phase contact wire and converting to three-phase through the phase splitter.

Mr. HUBER stated definitely that in

Switzerland the single-phase system on some lines, not less difficult than those of the Norfolk & Western, caused no trouble. The locomotives are employed in multi-traction as simply as steam locomotives.

At this point, and before the adjournment, Mr. VAN LOENEN MARTINET wished, in the name of the foreign delegates, to offer to their Italian colleagues their congratulations on the occasion of the « Noël de Rome ».

The reporters met together to edit the summary.

THE PRESIDENT said he proposed to devote some time to an exchange of information on: *a*) the direct supply of high tension direct current to the motors; *b*) inductive effects.

Mr. SEMENZA said he would be glad if the section would also deal with the important question of the transmission of the movement of the rotors of the motors to the axles, and also to the question of the recuperation of energy.

The President said he thought Mr. Semenza's suggestions were rather too detailed for the consideration of the Congress, but would see if the section could before completing find time for their discussion.

Mr. SABOURET asked that the Italian and Swiss delegates would give information as to the tractive effort permitted on their lines.

Mr. HUBER said that in Switzerland the limit had been raised from 10 to 15 tons, and on the Gothard line trains of 800 tons were handled with one locomotive at the head and one at the rear of the train.

Mr. DONATI stated that in Italy also they reached a limit of 15 tons for the tractive effort, the adhesive weight being limited to 60 tons.

### a) *Direct supply of high tension direct current to the motors.*

THE PRESIDENT called attention to the advantage, as far as shunting in the terminal stations is concerned, of the American practice in which the use of trailers was entirely abandoned.

Mr. JAPIOT (*Paris - Lyons - Mediterranean*) said it was quite possible to effect shunting by the sectioning of trains in the terminals, although the trains were formed of a certain number of motor cars and trailers.

Mr. DUER explained that on the Pennsylvania Railroad there were only motor cars used, that the terminal stations had not been provided with a sufficient number of side tracks for the switching of trains and groups of vehicles and that the cost of fitting all the cars was not so high as might be thought. The solution adopted by his Company avoided all the difficulties or failures which result from the overloads of a motor car called upon to haul too great a number of trailers; overloads which were bound to be permitted or ordered by the traffic department, at more or less frequent intervals, in emergencies.

Mr. PARODI stated that on the French State Railway they had at first fitted all the cars with motors. After a certain time it was recognised that the use of trailers caused no difficulty.

Mr. DONATI stated that in Italy on the Milan-Varese line with a third rail they had come to the same conclusion.

### b) *Inductive effects.*

Mr. **Huber** stated that in Switzerland there was no difficulty owing to the complete understanding between the railway and the telegraph and telephone administrations, all problems had been solved to the entire satisfaction of the administrations concerned. The administration of the telegraphs and telephones had been satisfied with renewing some lines and putting others in underground cables.

**The President** mentioned a case where at the beginning of the working of a tramway line the authorities had obliged the tramway company to abandon the return by rail and instal overhead wires for supply and return, in order to prevent the inductive effects on the telephonic circuits. He added there could be no question of discarding a traction system because there was not yet in existence devices sufficiently perfect to do away with inductive effects.

Mr. **Bachellery** (*Midi Railway of France*) said that his company had run for ten years a main line 31 miles (50 km.) long with single-phase current fed in at one end only. They had met with very great difficulty arising from the electrodynamic and electrostatic induction on the telegraph and telephone wires running alongside the track. Following complaints from the telegraph administration, they had carried out very extensive experiments and trials with a view to finding a remedy. They had arrived at a satisfactory solution of the problem by providing a return « feeder » with sucking transformers placed every 2 1/2 miles (4 km.), and by providing a screening wire. In all cases this arrangement cost a good deal of money and it has not been shown that a less costly solution is not possible in bringing the points where the line is fed closer together such as is done in the United States.

This question, however, had lost most of its interest in France, where the decision of the Government to insist on a single system on all the main lines employing electric traction had resulted in the adoption of continuous current at 1 500 volts.

Mr. Bachellery added that the difficulties which had arisen on his railway owing to the inductive effect of the single-phase traction current on lines with weak current had been one of the factors which led to the adoption of continuous current.

Mr. **Lanino** remarked that with the very first application of the three-phase traction, the Italian State had removed the « telecommunication » lines. In his opinion that was the safest means. M. Lanino considered that the use of direct current did not do away with all the disturbing effects.

Mr. **Fiori** (*Italian State*) stated that when the members visited the line Genoa-Bardonecchia they would have an opportunity of studying a new system of telegraphy by high frequency current devised by Italian engineers.

Mr. **Semenza** thought the question should be put as follows:

*a*) Technically, it is always possible, or in a very near future it will always be possible, to neutralise the inductive effects;

*b*) Economically, the doing away with the disturbing effects gives rise to expense which should be taken into account.

Mr. **Parodi**, who was supported by Mr. **Duer**, stated it resulted from experiments made in America, namely on the Chicago, Milwaukee & St. Paul, that no disturbing effect is to be feared with the use of direct current, even in the case of a short circuit.

### Final summary.

« 1° The Congress recognises that at « present a single system could not be « recommended for all cases any more « than in the past, nor is it possible to « choose between several systems, all of « which have proved their value under « the most severe conditions of operation; « the Congress recognises, moreover, that « these systems are all susceptible of « considerable further improvements;

« 2° The Congress agrees on the uselessness of standardisation of the type or « pressure of current in the contact wire « on account of the ease with which « locomotives may be changed at the « frontiers of the different countries;

« 3° It is desirable that the methods of « keeping and supplying technical and « economical information on electric « traction should be defined and standardised, and with this in view, the « section suggests that this point be referred to a special committee of the « Association. This committee should « draw up very fully the details governing each point so that in future as full « a comparison as possible may be made « by means of figures absolutely comparable. »

— The general meeting ratified this summary at its meeting of 26 April.

## MOTION.

### Utility of studying the question of the use of liquid fuel in locomotives.

### Preliminary document.

Note by Sir Henry FOWLER. (See English edition of the *Bulletin* of August 1921, p. 923, or separate issue [with red cover] No. 22.)

Special note summing up this motion, by Sir Henry FOWLER. (See English edition of the *Bulletin* of April 1922, p. 726.)

### Report of the 2nd section.

(See *Daily Journal of the session*, No. 9, p. 9.)

THE PRESIDENT asked Sir Henry FOWLER to give a summary of his report, which he did.

Mr. VAN SCHOUWENBURG (*Dutch East Indian Railways*) thought that the first paragraph of the proposals was too definite because the price of liquid fuel ought to be cheaper in the future.

Sir Henry FOWLER agreed to this suggestion, and proposed the text given below, which was approved.

With regard to the second paragraph of the summary Sir Henry Fowler called attention to the fact that the 5th section dealing with question XIX had called attention to the same point.

THE PRESIDENT asked if it was really necessary under these circumstances to retain the second paragraph with regard to standard railways.

Mr. BOCHET (*French Government*) asked that it should be allowed to remain, bearing in mind the improvements which are possible with internal combustion engines.

— The section approved of the second paragraph.

### Motion.

« 1° There are no mechanical difficulties in the adoption and use of liquid « fuel for locomotives. The question of

« cost both of the fuel and maintenance « makes its use, however, prohibitive at « present except in certain localities, and « these are so restricted that the subject « is not recommended for discussion im« mediately. If prices should vary, it « might, however, be desirable that it « should receive consideration later;

« 2° The question of the use of liquid « fuel in conjunction with internal com« bustion engines on locomotives is, how« ever, one of more general interest and « might be considered later. »

— The general meeting ratified this motion at its meeting on 28 April, and remitted it to the Permanent Commission.

# SECTION III.

## Working (Operation).

*President* : G. **Behrens**.

*Vice-Presidents* : The Right Hon Sir Evelyn **Cecil**, C. **Hanrez** and H. **Van Manen**.

*Principal secretary* : C. **Bonnevay**.

## QUESTION IX.

### Terminal stations for passengers.

Arrangements for reducing the number of movements of locomotives and empty rolling stock at passenger terminal stations.

### Preliminary documents.

1st report (countries using the English language), by Mr. A. S. Baldwin. (See English edition of the *Bulletin* of October 1921, p. 1483, or separate issue [with red cover] No. 35.)

Supplement to the 1st report, by Mr. A. S. Baldwin. (See English edition of the *Bulletin* of November 1921, p. 1927, or separate issue [with red cover] No. 35.)

2nd report (all countries, except those using the English language), by Mr. L. Maccallini. (See English edition of the *Bulletin* of March 1922, p. 553, or separate issue [with red cover] No. 62.)

Special reporter : Mr. L. Maccallini. (See English edition of the *Bulletin* of May-June 1922, p. 753.)

### Report of the 3rd section.

(See *Daily Journal of the session*, No. 6, p. 11.)

Mr. Maccallini (*special reporter*) read a resume of his own and Mr. Baldwin's reports, and the summary he submitted to the section.

Three types of passenger terminals had been compared for the advantages and drawbacks they offer : Stub or dead end terminals, loop terminals, and through terminals.

A discussion arose over a remark by Mr. Simon-Thomas (*Dutch State*), who did not consider stub or dead end stations, which had been chiefly dealt with by the special reporter, to be a good type. He mentioned instances, notably those of Leipzig and Zurich, where the stub or dead end terminals had proved anything but satisfactory.

Mr. Brisse (*Eastern Railway of France*) drew the attention of the meeting to the need of clearly defining what was meant by terminal stations before continuing the discussion.

The nature of the traffic is the determining factor. A terminal station is a station where there are no through roads, or else, where the trains which pass through it are few in number, the bulk of the traffic starting or finishing its journeys therein.

The lack of success referred to by Mr. Simon-Thomas is due to the fact that these stations are not true terminals, the through traffic being more important than the local. In cases where the suburban traffic is the more important, the dead end station situated in the heart of the town is, on the other hand, a necessity.

Mr. Crimail (*Chinese Government*) and Mr. Davies (*London & North Western Railway*) wished to know the reasons which led the Italian railways to contemplate constructing a dead end station at Milan in place of the present through station.

Mr. Vigna (*Italian State Railways*) explained the local conditions which led to this decision.

Mr. Brisse considered that the local traffic at Milan should justify this alteration, while on the contrary, at Lille the nature of the traffic has justified the substitution of a through station in place of an existing dead end station.

As regards the loop stations, so strongly recommended by Mr. Baldwin, while quite recognising the advantages of this type, he would like to know whether the use of a loop did not lead to a considerable increase in the number of platform lines. It entailed, in fact, a more specialised use of the lines, which was contrary to another proposed conclusion which recommended their common use.

An examination of the plan of the Grand Central Station at New York appeared to confirm this belief, since it appeared that there were seventeen platform lines for two running roads in each direction. This appeared to be a very high proportion.

Mr. Baldwin (*reporter*) gave some information respecting the organisation of such a station in answer to this objection.

Mr. Sabouret (*Paris-Orleans*) mentioned the special arrangements adopted at the Quai d'Orsay Station in Paris to overcome some of the defects of a dead end station which had not been mentioned in the reports. These consisted of an electric traverser for locomotives placed at the head of the station, this arrangement being rendered possible by the fact that this space is not utilised for platform accommodation.

Mr. Maison (*French Government*) remarked that in his opinion some of the proposed summary was too rigid, especially that which tended to justify by economy in working, the considerable expense of placing certain adjuncts, such as empty stock sidings, engine sheds, etc., as close as possible to the stations. In many cases it is as a matter of fact practically impossible to apply this to existing large terminal stations.

He proposed some amended wordings which were considered.

Mr. Payet (*French State Railway*) supported Mr. Maison's remarks, and quoted the particular case of the Montparnasse Paris Station.

Mr. Moutier (*Northern Railway of France*) also considered some of the summary as being too absolute. In his opinion, technical considerations are not always the preponderating factors in the choice of a type of station. Local sentiment and financial considerations have their effect in the majority of cases. Besides the reasons arising from the nature of the traffic, it is possible for example, that such considerations may account for the choice of the types of station at Milan and Lille.

Mr. Simon-Thomas having remarked that the common use of lines was sometimes dangerous and necessitated very complicated interlocking, Mr. Moutier quoted the case of the Nord Station in Paris, where complete common use was made of twenty-eight platform lines, in order to increase the capacity, when necessary, but where, under normal conditions of traffic, the lines were specialised in three groups, one for main line arrivals, one for suburban traffic and one for main line departures.

After the discussion had been continued by Messrs. Vigna and Nitesco (*Roumanian State*), and by Sir Herbert A. Walker (*London & South Western Railway*), the section decided to put forward the following summary to the general meeting :

### Final summary.

« 1° Whenever the local circumstances, « independent of the railway, do not « render the extension of the terminals « impossible, the economies of operation « and increase of the capacity of the stations justify considerable expenditure « for the purpose of providing lay-outs « and facilities leading to a reduction of « the number of movements of engines « and empty rolling stock. To this end « careful estimates of operating costs « should be made in the designs of new « plants and statistical data compiled for « the existing ones;

« 2° Loop terminals, where their installation is possible, are a most advantageous solution in order: to reduce to a « minimum the movements for quick « clearance of the platform roads; to turn « the trains; to give access to the sindings, « and to do away with the movements that « must usually be made in stub or dead « end terminals;

« 3° A triangle, preferably placed between the station and the sidings will « effect great economy in handling stock « in stub or dead end terminals;

« 4° A well designed lay-out at the entrance to the station is essential for the « economical operation and full utilisation of station roads or lines, particularly in the stub or dead end stations.

« 5° It is very advantageous to separate « as far as possible main line passenger « from suburban traffic;

« 6° The placing of vans for postal and « parcels services on separate lines necessitates a greater amount of shunting, « but has its advantages from other « points of view. Independent luggage « platforms, as well as mechanical means « for expediting the loading, unloading « and transfer of baggage, postal and « ordinary parcels, besides other advantages, tends towards a reduction of « shunting;

« 7° The use of common platform roads « for both the arrival and departure of « trains, causes less shunting than having « the trains discharge on arrival at specialised platforms different from those « at which they load up before departure. « In addition, the available room at a station is made better use of by this method of working;

« 8° In order to release the engines of « arriving trains in stub or dead end « terminals, it may be desirable, especially in suburban services, to connect « the platform roads, two by two, and « even with a central running road interposed;

« 9° Cross-overs at the ends of the « platforms and traversers between platform roads are very useful in helping « to reduce shunting;

« 10° The storage sidings must consist « of a sufficient number of lines to easily « deal with the maximum traffic; they « should be long enough to accommodate « the longest trains.

« They should be situated, as far as

« possible, when the space available « allows it, in the terminal, preferably « between the main roads or lines, and « arranged in such a manner as to have « the roads open to access at both ends.

« It is also advantageous to place the « locomotive sheds as close as possible to « the passenger stations, connecting them « up with independent lines which should « give easy access to the platform roads « and the storage sidings.

« If, however, as it is the case in some « large towns, the available room is limited, it is best to remove those features « that do not directly affect the passenger service — such as storage sidings « and locomotive sheds — to a point « away from the station. They should « then, however, be connected to the station by independent lines. In such « cases, if possible, auxiliary accommodation should be provided near the station at which the locomotives can be « turned and supplied with coal and « water;

« 11° Plenty of cross-overs and connections between the several roads tend to « simplify and reduce shunting. Large « double cross-overs at the end of the station, connecting all roads, are particularly useful;

« 12° It is desirable to carefully study « the make-up of the trains so that it is « not necessary to interfere with this in « stub or dead end terminals; in such « cases it will be found advisable to place « a brake van at each end of the train;

« 13° It is desirable to use the storage « sidings for cleaning, in order to avoid moving the empty trains;

« 14° From the point of view of the « reduction of shunting, electric traction « has great advantages over steam, chiefly « owing to the ability of electric locomotives to operate in either direction and « to the possibility of working, especially « for the suburban services, trains able « to run in either direction without displacement of the vehicles, by using « either a tractor at each end or the multiple unit system;

« 15° Movements of engines are reduced « if the empty vehicles are withdrawn on « arrival by means of the train engines, « without using shunting engines;

« 16° It is of great importance that the « various portions of the lay-out of a « stub or dead end terminal — including « locomotive sheds — should be placed so « as to permit of the proper sequence « of operation with the minimum of « shunting. »

— The general meeting ratified this summary at its meeting of 26 april.

## QUESTION X.

### Goods (freight) stations.

Organization of the receiving and the delivering stations, so as to accelerate their business.

Arrangement of the buildings and tracks so as to simplify shunting (switching) operations and handling, particularly as regards goods in bulk. Mechanical appliances.

#### Preliminary documents.

1st report (all countries, except Italy and those using the English language), by Messrs. Jullien and Moutier. (See English edition of the *Bulletin* of January 1922, p. 151, or separate issue [with red cover] No. 50.)

2nd Report (Italy), by Mr. E. Ehrenfreund. (See English edition of the *Bulletin* of January 1922, p. 5, or separate issue [with red cover] No. 50.)

3rd report (countries using the English language, by Mr. H. G. KELLEY. (See English edition of the *Bulletin* of May-June 1922, p. 785, or separate issue [with red cover] No. 63.)

Special reporter : Mr. JULLIEN. (See English edition of the *Bulletin* of April 1922, p. 675.)

### Report of the 3rd section.

(See *Daily Journal of the session*, No. 8, p. 8.)

In the absence of Mr. Jullien, special reporter, who was engaged in another section, Mr. MOUTIER (*French Northern Railway*) introduced the question, giving a brief summary of the various reports and putting forward the suggested summary to be submitted to the general meeting.

Mr. EIR (*Danish State Railway*) considered it was not always possible to separate the goods traffic from the passenger traffic, as recommended in the report.

Messrs. MAISON (*French Government*), VIGNA (*Italian State Railway*), HANREZ (*Belgian State Railway*), CRIMAIL (*Chinese Government*) agreed that such a separation is not always advisable, especially in the case of unimportant stations, or when dealing with fast goods traffic. One cannot lay down hard and fast rules on this point.

Mr. PAYET (*French State Railway*) and Mr. EIR pointed out that the special report appeared to recommend separate lines for loading and unloading wagons. This specialisation cannot be recommended in any case.

Mr. DAVIES (*London & North Western Railway*) said that he was opposed to having different freight sheds for arrivals, dispatches and transhipments. This system was not used in England.

Mr. BRISSE (*French Eastern Railway*) pointed out the general advantage of common sheds for loading and transhipments. It seemed beside the point to formulate hard and fast conclusions on the subject.

Messrs. BRISSE, VIGNA, NITESCO (*Roumanian State Railway*) though agreeing with the reporter as regards the undesirability of hindering the public in the work of loading and unloading by shunting on the lines used for these purposes, believed that it should be possible to do this several times a day, and stations should be organised accordingly.

Mr. BRISSE proposed a form of summary which was accepted.

The question of private sidings called for the special attention of the assembly.

The reporter concluded by stating, the necessity of extending them very widely, to which proposal others gave but a conditional assent.

Messrs. EIR, CRIMAIL, GUFFLET (*French Midi Railway*) were of opinion that though private sidings may be of great convenience to the public, they are not always such for the railways, since they often demand complicated shunting and often had but a small traffic.

Mr. MAISON requested also that it should be set down that a private siding can be refused for safety motives whenever it has to be connected directly with the main line.

Mr. HANREZ supported this motion, adding that in Belgium such connections are always refused.

Messrs. PAYET and VIGNA also supported the motion.

The section was unanimous in wishing to insert in the text of the summary some reservations in regard to the importance of traffic, facilities of service and the conditions to be complied with from the safety standpoint. A form of summary by Messrs. Crimail, Maison and Moutier was accepted.

After several remarks by Messrs. LUUYT (*Paris-Lyons-Mediterranean*), BALDWIN (*Illinois Central Railroad*), MAULDIN (*Great Eastern Railway*), FIALA (*Czecho-Slovakia State Railway*) and ARRILLAGA (*Madrid-Saragossa*), the section decided to propose the following :

**Final summary.**

« 1° In goods stations the lines intended for loading and unloading should « be connected as far as possible by independent lines to the arrival, departure « and shunting sidings;

« 2° It is advisable that stations should « be arranged in such a way that the placing and the withdrawal of wagons may « be effected at different times in the « same day, also while stations are open « to the public;

« 3° Mechanical equipment, and particularly the use of capstans, add to the « efficiency of the lay-out and to the « rapidity of shunting. These are of the « greatest utility, especially in seaport « stations and wherever one has to deal « with bulky heavy materials, such as « coals or minerals;

« 4° The allotment of special goods « stations for different classes of traffic « is advisable in some cases;

« 5° Private sidings, which are generally a great convenience to the public, « can increase the capacity of stations, « provided they are justified by sufficiently important traffic, that they are « well laid out, and that they connect « with the railway in such a way as to « facilitate shunting.

« It is convenient to connect these to « an independent line, rather than to the « main lines, whenever the quantity of « traffic or the number of sidings warrants this. »

— The general meeting ratified this summary at its meeting of 26 April.

## QUESTION XI.

### Slow-freight traffic.

Organization of slow-freight traffic, in order to increase the effective operation of the rolling stock and the lines. Advisability of using, according to circumstances, heavy or light trains, fast or slow trains. Through trains. Pick-up trains, distributing trains. Shuttle services.

**Preliminary documents.**

1st report (all countries, except America, Belgium, France and Great Britain), by Mr. E. EHRENFREUND. (See English edition of the *Bulletin* of April 1921, p. 377, or separate issue [with red cover] No. 14.)

2nd report (Great Britain), by Sir Herbert A. WALKER. (See English edition of the *Bulletin* of November 1920, p. 731, or separate issue [with red cover] No. 4.)

3rd report (France), by Mr. GUERBER. (See English edition of the *Bulletin* of June 1921, p. 641, or separate issue [with red cover] No. 17.)

4th report (Belgium), by Mr. U. LAMALLE. (See English edition of the *Bulletin* of July 1921, p. 857, or separate issue [with red cover], No. 21.)

5th report (America), by Mr. W. H. WILLIAMS. (See English edition of the *Bulletin* of August 1921, p. 1087, or separate issue [with red cover] No. 25.)

Special reporter : Mr. U. LAMALLE. (See English edition of the *Bulletin* of April 1922, p. 678.)

### Report of the 3rd section.

(See *Daily Journal of the session*, No. 4-5, p. 7.)

Mr. LAMALLE (*special reporter*) gave a brief resume of the five reports which had been prepared on this question. He drew attention to the difficulty in drawing up a summary on the whole of the reports, in consequence of the differences between American practice and that of the Continent of Europe or Great Britain. The deductions of his general report gave the meeting a true statement of facts, but at the same time in a rather extensive form. Mr. Lamalle would draw up a more concise resume to be presented to the section at a forthcoming meeting.

Mr. BRISSE (*French Eastern*) stated that in his opinion that part of the general report which dealt with the capacity and tonnage of wagons is outside the scope of the present investigation, which should only deal with the organisation of transport in order to obtain a more efficient use of existing rolling stock, whatever this might be.

The REPORTER replied that the organisation of transport with a view to increasing the carrying capacity of the railways depends upon the rolling stock employed, and for this reason it would appear of interest to draw attention to present day tendencies.

Mr. MAISON (*French Government*) and Mr. NITESCO (*Roumanian State*) agreed with Mr. Lamalle on this point.

The tendency to increase the tonnage and capacity of wagons, mentioned by the special reporter, is not a matter of controversy, as far as the past is concerned, but the majority of the assembly is of the opinon that a satisfactory compromise has been arrived at.

Mr. EHRENFREUND (*reporter*) drew attention to the fact that the various reports mention difficulties experienced with rolling stock having too high a tonnage.

Mr. CRIMAIL (*Chinese Government*) considered that it is necessary to emphasise the fact that a considerable and continual increase in the size of rolling stock is not desirable.

Mr. PAYET (*French State*) remarked that the maximum tonnage depends in the first place on the nature of the preponderant traffic. Industrial custom should not determine the choice of rolling stock, but these customs should be changed whenever they are prejudicial to economical transport. He quoted an example in which the French State Railway had been successful in reconciling the public to a change in methods, which had been very advantageous.

Mr. TATLOW (*Midland Railway*) stated that a special committee appointed in England to select the type of rolling stock to be built in the future has in the end selected a wagon of 12 tons only, although the bulk of the traffic consists of coal.

Sir Evelyn CECIL (*London & South Western Railway*) pointed out that this only refers to rolling stock for general use, and that the use of high capacity wagons is not excluded.

After the discussion had been continued by Messrs. Maison, Watson (*London & North Western Railway*), Baldwin (*Illinois Central Railroad*) and Moutier (*French Northern*), it was agreed simply to mention the increase in the capacity of wagons and to mention that the nature of the traffic is a determining factor.

As regards the subject of the common use of rolling stock by various companies in the same country, it appeared from the discussion, that the reporter has had in view, not merely the running of one company's wagon over another system to avoid transhipment, but the general use of these wagons, so that as regards their use they form a common stock.

Mr. Tatlow explained that in England, before the war, there had been a simple exchange of rolling stock, with a record kept of the destination of wagons, but now the practice is to make common use of wagons. This system is considered advisable.

Mr. Morse (*Pennsylvania System*) stated that wagon sheets are not used in America, and in consequence a modification was made in the text, and was agreed to.

Mr. Nitesco asked if certain companies run trains solely for picking up or detaching at wayside stations.

Mr. Moutier cited the case of the French Northern on which trains run as « pick-up » trains over a certain part of their journey, and then as « through trains », or inversely, in the case of detaching trains.

On the proposal of Mr. Pretorian (*Roumanian State*) mention was made of trains picking up or detaching wagons en route.

While mentioning the increase in the number of wagons forming a train, the section were opposed to giving any definite figures on this subject.

Mr. Watson said that in England this may be as much as 120 empty wagons or 80 loaded.

Following a remark by Mr. Vigna (*Italian State*), the discussion, in which Messrs. Maison, Luuyt (*Paris-Lyons-Mediterranean*), Watson and Schiavon (*Italian State*) took part, turned on to the question of banking engines and double heading. The reporter stated that he wished to draw attention to two different cases, that in which double heading is used on lines with long and steep inclines or in very undulating country, and that in which a banking engine is used on short inclines, being additional in some cases to double heading.

Mr. Schiavon asked that mention should be made of the need of maintaining the load constant and at its maximum, which was the justification of these practices.

As regards the subject of the most economical speed of trains, from a commercial point of view, Mr. Watson proposed a new text, which was agreed to by the reporter and adopted.

The attention of the assembly was then directed mainly to the question of the transport of goods in small quantities.

Mr. Epinay (*Paris-Orleans*) remarked that if it is true that rapidity of transport ought not to be obtained to the detriment of the efficient use of rolling stock, unfortunately the time limits which are usually imposed upon the railways do not always allow this principle to be adhered to.

The reporter replied that it goes without saying that the regulation time limits must be observed, and therefore it is desirable that these times should not be too short.

The question of complete wagon loads for goods in small quantities was then discussed.

Mr. LONEY (*Midland Railway*) stated that in England a load of 1 ton (1 000 kgr.) was considered sufficient for a wagon to be sent direct.

Mr. EHRENFREUND drew attention to the fact that it might be inadvisable to discuss this question before the general public, on whom fairly high minimum tonnage conditions are as a rule imposed, and who might be astonished to find in the text that the railway administrations consider a load of 1 1/2 tons (1 500 kgr.) sufficient to warrant the use of a separate wagon.

Mr. HENRY-GRÉARD (*Paris-Orleans*) was of the same opinion, and asked that no mention should be made of the minimum load.

After various observations by Messrs. PRETORIAN, CRIMAIL, Sir Herbert A. WALKER, Messrs. HANREZ, VIGNA and MAISON, a new text was drawn up by the reporter and adopted.

The acceptance of goods in small quantities on particular days, according to their destinations, was considered very satisfactory as regards the efficient utilisation of rolling stock, but it necessitates a previous arrangement with the traders, for this method could not be enforced upon them.

In reply to a question by Mr. EHRENFREUND, Sir Herbert A. WALKER stated that this is common practice in England.

Mr. PAYET also was strongly in favour of this method, which has in some cases been successfully introduced on the French State Railway.

Mr. SCHIAVON thought that this could scarcely be justified except where the railway accommodation was insufficient to store in warehouses the goods that are not forwarded on the same day as they are received.

An analogous case was cited by Mr. FIALA (*Czecho-Slovakia State*), who informed the section that the Czecho-Slovakian Railways have made an arrangement with the refiners so as to distribute the traffic over certain periods; the transport of coal and limestone is carried out in the Summer, so that the beet crop can be handled without difficulty at the time of the harvest in October.

Messrs. EHRENFREUND, MAISON and VIGNA, speaking on the subject of shunting engines, insisted on the necessity of using not only powerful locomotives, but also of types suitable for shunting.

As regards the question of the influence of rates on the utilisation of rolling stock, it is stated that in Italy a deposit is as a rule required from the public when they requisition rolling stock.

Mr. VIGNA explained that this was only done in order to prevent abuses on the part of the public, but very often in practice it corresponds to the actual loss incurred by the railway.

Sir Herbert A. WALKER stated that in England demurrage is charged for wagons which are not loaded in a stipulated time, just as in the case of wagons the unloading of which is delayed.

Mr. MOUTIER stated that formerly they had successfully adopted on the Northern Railway a system under which reduced rates were charged to traders who unloaded their wagons with the least delay.

Finally the section decided to submit the following text to the general meeting :

### Final summary.

« 1° Within the limits allowed by traf-
« fic conditions and by the maximum
« permissible axle load, there is a gen-
« eral tendency to increase the tonnage
« and capacity of wagons. In Europe
« preference is given for a tonnage of
« 12 to 20 tons, and in special cases, for
« certain heavy goods, of higher capaci-
« ties of 40 to 50 tons. In America these
« figures are always exceeded, and is
« sometimes as great as 100 short tons;

« 2° In order to reduce empty wagon
« mileage, the administrations attempt as
« far as possible to limit the number of
« types of wagons.

« For the same reason, on the continent
« the railways leave the construction of
« wagons for special purpose to private
« enterprise.

« In cases where there are several com-
« panies working the lines in the same
« country, the « common user » utilisa-
« tion of stock has a beneficial effect in
« reducing the empty wagon mileage;

« 3° There is tendency among European
« railways to construct more open
« wagons, the contents being protected by
« sheets.

« A number of railways facilitate the
« sheeting of wagons by providing
« movable supporting bars.

« 4° The question of whether trains
« should run as through trains or should
« pick up or detach wagons en route must
« depend on the volume and nature of the
« traffic;

« 5° There is evidence of a tendency to
« increase the number of vehicles in the
« make up of freight trains.

« In order to avoid the necessity of re-
« ducing the load below the normal, the
« use of banking engines on steep grad-
« ients is common practice, and two or
« three engines are used to work trains
« over lines with long and heavy grad-
« ients or through undulating country.

« Heavy trains run for the most part
« at slow speeds; light trains run at high
« speeds are the exception;

« 6° It is desirable that transport should
« be as rapid as possible, provided trains
« are loaded to their maximum tonnage.

« The working time-table should be ar-
« ranged so as to take full advantage of
« the carrying capacity of the lines;

« 7° In dealing with goods in small
« quantities, rapidity of transport should
« not be obtained to the detriment of the
« economical use of rolling stock.

« The minimum load for a single wag-
« on, fixed by the administrations, with
« a view to making sufficiently good use
« of rolling stock, and at the same time
« meeting the public demand for rapid
« transport, varies from 1 1/2 to 3 tons
« (1 500 to 3 000 kgr.); in England it is as
« low as 1 ton (1 000 kgr.).

« Whenever traffic conditions warrant
« it, the acceptance of goods on particular
« days is beneficial to the efficient utili-
« sation of rolling stock;

« 8° Rapidity of shunting is dependent
« on the use of powerful locomotives of
« suitable types which are well up to the
« work.

« They should be handled by men ac-
« customed to this special duty.

« The use of gravity shunting is ever
« increasing, either by placing the sid-
« ings on an incline, or by using a
« hump ».

« The payment of a bonus to shunters
« has the effect of increasing the output
« of the sorting sidings, and consequently
« of the rolling stock;

« 9° In order to induce the public to « make full use of rolling stock, different « rates are charged according to whether « the load is equal to or only part of the « full capacity of a wagon.

« For the same reason, special reduced « rates are charged when the consign- « ment is equal to the capacity of several « wagons or to a whole train load;

« 10° In order to speed up the unload- « ing of wagons, advice notes are sent out « by the most rapid means, and a large « number of administrations inform the « consignees by telephone.

« For the same reason, wagons which « are not loaded or unloaded within sti- « pulated times are charged demurrage « fees, which are fixed on different bases. « In this respect some administrations « not only take into account the length of « the delay, but make the charges depen- « dent on the weight of the goods to be « unloaded. Where the demurrage fees « are based on the length of the delay, « they are directly proportional to the « same, or else increase progressively.

« Steps are sometimes taken to prevent « unreasonable demands for wagons on « the part of the public.

« Good results have been obtained by « charging reduced rates to traders who « unload their wagons in a shorter time « than that allowed by regulation. »

— The general meeting ratified this summary at its meeting of 27 April.

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## QUESTION XII.

### Locomotive cab signals.

Repeating and recording the track signals on the locomotive. Different systems already used or tried. Results obtained.

Recording the running speed of locomotives.

#### Preliminary documents.

1st report (France), by Mr. F. Maison. (See English edition of the *Bulletin* of November 1921, p. 1709, or separate issue [with red cover] No. 39.)

2nd report (France), by Mr. J. Verdeyen. (See English edition of the *Bulletin* of March 1922, p. 537, or separate issue [with red cover] No. 63.)

3rd report (all countries, except France), by Mr. F. Villa. (See English edition of the *Bulletin* of May-June 1922, p. 821, or separate issue [with red cover] No. 65.)

Special reporter : Mr. J. Verdeyen. (See English edition of the *Bulletin* of April 1922, p. 738.)

#### Joint report of the 2nd and 3rd sections.

(See *Daily Journal of the session*, No. 6, p. 12, No. 8, p. 9 and No. 9, p. 9.)

The President drew attention to the following resume proposed by the three reporters, Messrs. Maison, Villa and Verdeyen, dealing with the first part of the question relative to cab signals :

1° The repetition of signals on locomotives is used at the present day chiefly for fast and express trains and for the heavy freight trains;

2° Repeating the signals must be considered solely as an adjunct to the safety measures intended to make the observation of signals easier; in no case can it be a question of substituting this system of signals for the track signals, the direct observation of which by the driver will always remain the greatest guarantee for safety;

3° The repetition of signals should be arranged in such a manner as not to dull the attention of the driver, and with this object, the apparatus should at the same time as it conveys a warning to the driver that the signal he is approaching is at danger, record his passing this signal. The record should be made in such a manner that the exact position of the signals passed is recorded, and with this object it is necessary to reproduce it on the tape of the speed recorder. Warning should only be given to the driver for signals standing at danger, but it may be of advantage also to record the signals standing at line clear, distinguishing these from those at danger, and to bring their passing to the notice of the engine driver by means of an audible signal that can only be heard on the footplate.

In addition, it is advisable, with a view to safety, to establish a check on the vigilance of the driver by obliging him to operate a quick and simple recording device when he sees a signal at danger;

4° The repeating of signals should only be applied to signals which are met at a high speed without any preceding signal to warn the driver;

5° Warning should be given to the driver by an audible signal, distinct as far as possible from the ordinary locomotive whistle, and loud enough to be heard not only by the driver, but also by others of the train crew. Repeating the signal by the indication of a visual disc in the locomotive cab does not commend itself and can only be allowed if it is accompanied by the audible signal;

6° It is not advisable for the apparatus to act on the brakes of the train and thus cause an automatic stop, even though the driver could prevent this action taking place;

7° By reason of the necessity for registering the position of the signals that have been passed, it is necessary to arrange the track contacts, which should operate the warning and recording appliances when the locomotive runs over them actually at the signal itself or only a few yards in advance of the signal, in such a manner that there may be absolute agreement between the recording tape and the position of the signal seen by the driver at the moment that he was passing it;

8° The repeating of signals in the cabs of locomotives may be carried out by electrically or purely mechanically driven apparatus. In France the crocodile type of apparatus is preferred, and it is capable of application to single lines without difficulty. It can also be applied equally well to electrified lines.

Mr. Maison (*French Government*) reviewed the whole subject. He stated in the first place that there were two separate parts of the question : 1° The repetition of signals upon locomotives; 2° The recording of speed. These two points were the object of separate investigations and conclusions on the part of the reporters and ought to be considered separately by the section.

As regards the repetition of signals upon engines, Mr. Maison gave an account of its development in France, and expressed the opinion that the number of accidents which had occurred had led the public to recognise the necessity of repeating the signals.

Mr. Maison drew the attention of the section to the three principal points :

*a*) Should signals in the « off » or « clear » position be repeated?

*b*) Are automatic train stops advisable?

*c*) Should there be a visible signal in the engine cab?

Mr. Maison was of the opinion that the repetition of signals in the « off » position, if adopted, should be arranged so as to be quite distinct from the repetition of danger signals, and in such a way as not to disturb the attention of the driver. He also thought that an automatic train stop was difficult to arrange, because of the different speeds of various trains running on the same line; yet at the present time, systems including the automatic stop were being accepted in France for investigation and experiment, though these apparatus were rejected without being examined 20 years ago. The visible signal in the cab did not appear to him to be desirable, because the driver should watch the signals along the line and not those in his cab.

Mr. Maison also explained that in France, all warning signals and all distant signals (red discs) would be repeated on main lines and on other lines making junction with main lines, both for single and double lines. The equipment of the lines and engines will be completed by 1 July 1924.

Colonel J. W. Pringle (*British Government*) stated he had been the president of a commission appointed to examine this question in the United Kingdom, and this commission considered that of all the serious accidents occurring in Britain in the space of ten years, more than one third would have been avoided by the repetition of distant signals, and more than one sixth by the repetition of stop signals.

He thought therefore that repeating devices are desirable for distant signals and for certain stop signals, but in the United Kingdom only in the case of double lines. As regards single lines, the existing safety devices are quite sufficient.

Mr. Duchatel (*French Eastern*) said that he shared in the astonishment and disagreement which some of the opinions expressed in Mr. Maison's report had given rise to among the locomotive engineers of the French railways. He could not let pass without protest a report from which one might be led to conclude that the observation of signals on the part of the driver was difficult, or their disregard excusable. In view of the acceleration of trains and the increase in the length of the boiler barrel, the French railways had not neglected this subject. They were giving great attention to improving the visibility of signals from the footplate. For the same reason they were again arranging for engines to be driven from the left hand side. The siting of the fixed signals had been revised, and where necessary, auxiliary signals provided to give warning that the principal signal was being approached.

Coming to the rest of the question, Mr. Duchatel considered that it is not proved that the repetition of signals upon locomotives would lead to an increase in safety. Besides considering rules and regulations, the psychological factor must be taken into account. Is it really thought that a driver will pay as much attention to the wayside signals, if these are repeated in the cab? One must compare the present failures of a driver who relies solely on his eyesight with the future failures arising both from the driver and also from the apparatus when the former is dependent on the latter. In which is the greater safety?

Mr. Duchatel thought that only experience could prove this point, and he should hope that there would be no cause to regret the measures which are about to be adopted on the French railways.

. Mr. Moutier (*French Northern*) insisted on the necessity of a simple apparatus, to avoid as far as possible any failures in working which might be caused by the addition of accessory fittings, and was emphatic as regards the serious objections which would certainly arise, both as regards the rolling stock and also from a psychological point of view, if the brake were to be automotically applied.

Mr. Maison contested the view taken by Mr. Duchatel, and emphasised the increase in the average running speed of trains during the last twenty years and the much greater amount of attention required in driving modern locomotives.

Mr. Maison drew attention to the fact that the « crocodile » has been in use on the French Northern for twenty years, and it cannot be truly said that the use of this apparatus on this railway has resulted in making the drivers less vigilant.

Mr. Sabouret (*Paris-Orleans*) remarked that the conclusions proposed by the reporters referred mainly to the investigations of the French administrations, and it did not seem quite satisfactory that the Congress should assent to the generalisation of a system which has not been proved in actual practice.

After a discussion in which Messrs. Nitesco and Pretorian (*Roumanian State*), Verdeyen (*reporter*), Sir Herbert A. Walker (*London & South Western*), Sir Henry Fowler (*Midland Railway*), Moutier and Lamalle (*Belgian State*) took part, it was decided that new and less rigid deductions should be prepared by the reporters.

Mr. Maison read the amended text, which was put to the section :

### 1. — *Cab signals.*

The repeating of signals on engines has been attracting the attention of railways more and more.

On continental railways where the system has been adopted, the present position of the question is as follows :

1° The system is in use on lines on which trains run at high speed, and on lines with heavy traffic; it is applied only to those signals which a driver approaches at speed without previous warning;

2° The system should be regarded solely as an auxiliary safety measure to assist the observation of fixed signals, and it should be arranged in such a manner as not to impair a driver's vigilance. To ensure this there are grounds for introducing with the system means for checking the vigilance of a driver;

3° The apparatus should give an audible warning before a signal in the danger position is reached : on some lines an indication is also given to the driver when the signal is clear.

The repeating of a fixed signal by means of a visible signal in the cab should only be accepted on condition that it is combined with an audible signal.

Repeating apparatus are usually combined with instruments for recording when signals are passed in the danger position, and sometimes also when they are passed in the clear position.

In England, train control is installed on some sections only of the Great Central, the Great Western and the North Eastern Railways.

The apparatus is only fitted to the distant signals, except on the Great Central, where it is also fitted to the home signals.

The apparatus fitted to the distant signals partially applies the brake and generally sounds an audible signal which differs according as the signals are « on » or « off ».

On the Great Central, the apparatus fitted to the home signals causes a full application of the brakes on the train.

On the urban lines, such as the Metropolitan and Tubes, a train control apparatus, completely braking the train, is installed at each stop signal.

No provision is made for recording the working of the apparatus.

The question of train control forms the subject of a Government Commission, whose report is not yet published.

### II. — *Speed recorders.*

1° It is very desirable to fit all main line engines with speed controlling apparatus. To fulfil this requirement, they should both indicate and record the speed;

2° The use of indicating and recording instruments as a rule renders the use of stationary speed recording apparatus unnecessary, but these may still be of utility at special points on the line where it is desired accurately to determine the speed;

3° The instruments are only used as a check on the running of trains, and should not relieve train crews or station staffs of taking all time records relating to the running of the trains or to the carrying out of shunting operations.

This summary gave rise to a discussion in which Messrs. MAISON, DUCHATEL, VILLA and SCHIAVON (*Italian State*). NITESCO, BALDWIN (*Pennsylvania Railroad*), LACOIN (*Paris-Orleans*), A. WATSON (*London & North Western*), BOCHET (*French Government*), PRETORIAN, BACHELLERY (*French Midi*) took part.

As a consequence of this discussion, Mr. WATSON, who was supported by Mr. PRETORIAN, moved an amendment to the first part, which was adopted.

As regards the speed indicators and recorders; after a statement by Colonel J. W. PRINGLE that these instruments are not used in Britain, except for experimental work, and that there is no intention of using these for every day service, and a discussion in which Messrs. SCHIAVON, NITESCO, LACOIN and MAISON took part, the following text was agreed to for submission to the general meeting.

#### Final summary.

« 1° The question has been carefully con-
« sidered by the reporters and members
« of the 2nd and 3rd sections combined,
« but it appears that it is impossible to
« arrive at definite conclusions, because
« the matter is still in the experimental
« stage. The results of these experiments
« may be dealt with at a future Congress;

« 2° The use of instruments for indicat-
« ing and recording the speed is very gen-
« eral on the continent.

« The use of these instruments as a rule
« allows the railways to dispense with
« stationary instruments for measuring
« the speed of engines, but these may still
« be useful at certain points where it is
« necessary to determine the speed in an
« accurate manner.

« The instruments are only used as a
« check in the running of trains.

« These instruments are not used in
« Britain or America. »

— The general meeting ratified this summary at its meeting of 28 April.

# SECTION IV.

## General.

*President* : J. PAUL.

*Vice-Presidents* : W. ATTERBURY, A. DEJEAN, J. DE OLIVEIRA SIMÕES and H. VAN DER MINNE.

*Principal secretary* : Baron C. KRAYENHOFF.

## QUESTION XIII.

### Net cost. Rates.

Determination of the net cost of carriage (passengers and goods), taking capital charges into consideration. Its relation to rates charged.

#### Preliminary documents.

1st report (America), by Mr. F. HARRISON. (See English edition of the *Bulletin* of September-October 1914, p. 857, or separate issue [with red cover] No. 5.)

2nd report (all countries, except America), by Mr. HENRY-GRÉARD. (See English edition of the *Bulletin* of February 1922, p. 331, or separate issue [with red cover] No. 58.)

3rd report (America), by Mr. S. O. DUNN. (See English edition of the *Bulletin* of January 1922, p. 123, or separate issue [with red cover] No. 53.)

Special reporter : Mr. HENRY-GRÉARD. (See English edition of the *Bulletin* of April 1922, p. 745.)

#### Report of the 4th section.

(See *Daily Journal of the session*, No. 2, p. 12 and No. 4-5, p. 6.)

Mr. HENRY-GRÉARD (*special reporter*) gave a summary of the three reports sent in by the reporters.

Mr. SERANI (*Italian State Railways*) explained his method of finding the net cost based on the hypothesis of uniformity of cost per axle-kilometre of express traffic and per axle-kilometre of slow traffic. He requested that a number of railway systems should furnish him with particulars in order to verify this method.

Mr. HENRY-GRÉARD was of opinion that Mr. Serani had not proved that his purely hypothetical method was any better than the process of examination of each case, based upon concrete elements submitted by the reporters.

After a discussion between Mr. PAYET (*French State Railways*) and Mr. SERANI on the details of Mr. SERANI's method, the latter admitted that his, like all other methods, has only a comparative value and does not furnish any absolutely definite results.

Mr. MEREUTZA (*Roumanian State Railways*) considered that the study of net cost should not be conducted in the same way on the State as on the other railways, and that its application as a basis of rates, particularly on State systems, is quite delusive.

THE PRESIDENT, having summed up the discussion, and after some remarks by Messrs. BRISSE (*French Eastern Railway*), MEREUTZA, HENRY-GRÉARD, DUNN (*re-*

*porter*), and Serani, the 4th section adopted unanimously the following summary :

### Final summary.

« 1° The splitting up and allocation of
« the total expenditure between the var-
« ious classes of traffic is possible on
« condition that each subject involving
« expenditure is independently examined,
« and if necessary, tests made of concrete
« examples.

« In America this allocation is obtain-
« ed by the statistical method which the
« Interstate Commerce Commission has
« recently put into operation;

« 2° A proper allocation of capital
« charges offers such difficulties that in
« most cases only arbitrary estimates can
« be made;

« 3° Under these conditions, the results
« obtained for the allocation of net costs
« are naturally very approximate and
« only of value to serve as a guide to
« roughly apportion to each class of
« traffic a statistical value of their net
« earnings;

« 4° Net cost neither is, nor can be, the
« determining factor for fixing rates on
« any railway, but a knowledge of it is
« a useful element in the investigations
« connected with this subject. When the
« result of such investigations tend to
« increase traffic by some alteration made
« in the rates, it is advisable that the
« average cost price, which only takes
« into account traffic actually carried,
« should not solely be taken into con-
« sideration, but the partial cost price
« from which are excluded expenses in-
« dependent of the intensity of the
« traffic. »

— The general meeting ratified this summary at its meeting of 26 April.

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## QUESTION XIV.

### Customs examination.

Organization to be adopted for the customs examination of luggage, so as to reduce to a minimum the inconvenience to passengers, while safeguarding the interests of the custom-house and of the railway. Establishment of international custom-house stations.

### Preliminary document.

Report, by Messrs. Jourdain and Prudent. (See English edition of the *Bulletin* of November 1921, p. 1801, or separate issue [with red cover] No. 40.)

Special reporter : Mr. Prudent. (See English edition of the *Bulletin* of April 1922, p. 691.)

### Report of the 4th section.

(See *Daily Journal of the session*, No. 8, p. 10.)

Mr. Bonnevay (*P. L. M. Algerian Railways*) gave a summary of the various reports dealing with this subject.

Sir Henry Thornton, K. B. E. (*Great Eastern Railway*) stated in a communication that it is of the utmost importance the Congress should direct its efforts towards the simplification of the customs formalities and passport visa, and insist on reducing these as far as possible to their pre-war simplicity. It is certainly of the greatest importance that through travellers, crossing various territories, should be allowed to pass through the different controls of luggage and passports at the different frontier stations, and that all this work be carried out at one joint station only.

Mr. Brant (*South Eastern & Chatham Railway*) gave a report in which he stated that he would like an alteration in the clause relating to the examination of luggage in the course of the journey. He proposed the adoption of a resolution that: « Passenger luggage, both handbaggage and registered luggage should be examined in the train whenever they are composed of intercommunication corridor stock. That the examination be carried out during the journey from the frontier stations to the next convenient stopping place. The stoppage at the frontier should be reduced to the minimum necessary for railway purposes and for the examination of registered luggage, when such cannot be carried out in the luggage van. »

The aim of the railways should be to do away with the inconvenience and expense caused to passengers by having to alight from trains, and, if necessary, a surtax might be made for the examination of registered luggage as is already done in the « trains de luxe ».

After interchange of views, the PRESIDENT stated that both reports show that the wishes of the English railways correspond to those of the section itself. It seems necessary that the railways should press their various governments to arrange for greater simplification and consequently more facilities with regard to through travellers, by having the customs and passport examination made in the course of the journey in the train. If this causes extra cost to the customs, an extra charge might be made to travellers by the railways, which could be passed on, if necessary, to the customs officers.

Mr. VIGLIONE (*Italian State*) agreed with the idea of a surtax, but he thought that this ought to cover, not only the extra costs of the customs officers, but also the expense to the railways which would be caused by it.

Mr. CHARRON (*French Midi Railway*) considered that the railways should pay a part of the extra expense because it is possible that they might economise through things being simpler at the frontier stations, where they would require a smaller staff.

Mr. VIGLIONE did not think that it would enable the railways to have a smaller staff at frontier stations, as the local trains would in any case compel them to have a certain number of employees at these stations.

After having heard the remarks of Mr. VIGLIONE and Mr. GORJAT (*Swiss State Railway*), the section was of opinion that it is desirable to charge the passengers extra for their through registered luggage in case the examination is made during the course of the journey. This means of course that an extra charge is only to be made when the luggage is carried in through-corridor trains. The railways should agree to an arrangement by which they would collect a surtax from the passengers and pay the customs authorities the extra cost they had incurred through having to examine the luggage on the journey.

The collection of this surtax and the difficulties which it would cause were discussed. After an argument between Messrs. PAUL (*president*), VIGLIONE, DIREZ (*French State Railway*) and GORJAT, the section agreed that this surtax ought only to be charged on luggage carried on corridor trains, and that the charge should be made at the starting stations at the time the luggage is registered. The registration ticket should show that it had been collected. If it was not done at the time, passengers would be obliged to pay when the customs' examination is made in the luggage van.

Mr. SOULEZ (*Northern Railway of France*) would like to have the luggage examination made as far as possible in the train during the journey, and agreed with the principle of charging extra for these customs facilities. He was of opinion that the section should also reconsider the question in special cases of the examination of luggage at departure stations, and that the subject should not be considered as settled.

Mr. GRILLO (*Italian State*) and Mr. SIMON-THOMAS (*Dutch State*) pointed out the great convenience found in Sweden by the use of specially arranged luggage vans, which greatly facilitates the customs' examination.

As regards the customs officers' visit in non-corridor trains, the PRESIDENT asked if it might not be possible to examine the luggage either in the van or even on the platform, by unloading in the latter case, a portion of it to the extent necessary to enable the surplus to be examined in the van itself.

Mr. COOPER (*London Brighton & South Coast Railway*) said that in England they have already arranged for the examination to take place at the platform on which the train comes alongside.

This considerably simplifies the carrying and loading up of luggage and is much appreciated by the passengers, and also reduces the work of the customs officers.

After an exchange of views, this suggestion, which ought to cause less delay to trains in the frontier station, was agreed to by the section.

Discussing then the question of joint frontier stations, and after having heard the remarks of Messrs. VIGLIONE and PAUL, and a summary of the report of Mr. GENOVESI (*Italian Government*), the section agreed to the necessity of having joint international stations, and where these do not yet exist, to build them instead of having two stations at each frontier.

Referring to the question raised by Mr. SOULEZ, Mr. VIGLIONE gave particulars regarding the examination of luggage at the departure station at Vienna, destined for Italy. At this station all such luggage is examined by the Austrian customs and forwarded sealed.

He prefered the examination to be made before departure at all those towns where this can be arranged, especially in those cases where there are two distinct railway stations at the frontier.

Mr. MEREUTZA (*Roumanian State Railway*) considered that in order to encourage the examination to be made in the interior of the country, it would be advisable to defray the expenses of the customs authorities.

Messrs. VIGLIONE and KRAYENHOFF (*principal secretary*) were not of this opinion, and thought that neither railways nor travellers should pay extra to the customs officers for their work, these being paid by their governments. Moreover, part of the facilities would also benefit the goods traffic, and in this case it would be right to demand a surtax also from the consigners of goods.

Mr. SIMON-THOMAS pointed out that charging the surtax will cause extra work for the clerks who have to register the luggage, and this consequently will also cause a delay in registration. As regards goods traffic, consignees have to go to the agents to get their goods, where they have to pay all the charges at the same time. Mr. GORJAT stated that in Switzerland the customs receive no payment for visits made in the interior of the country, because the railways hand over the articles to the customs house itself, where the passengers call for them. In this way all the handling is done by the railway. He suggested therefore to abolish the idea of a surtax, and at the same time encourage that of examining the luggage in the interior of the countries.

The section agreed with Mr. Gorjat's proposal.

After having briefly considered, on account of its small importance, the question of forwarding luggage kept back at frontier stations, the section decided, after having heard Messrs. VIGLIONE and KRAYENHOFF, to agree with the conclusion arrived at by the so called Passport Conference held at Paris 21 October 1920 for all matters concerning customs formalities.

Mr. SIMON-THOMAS did not agree that the establishment of joint international stations at transit points would be of such an advantage to railway companies as the reporters imagine. Mr. VIGLIONE replied by showing the advantages that would be obtained in forming the trains, simplification in shunting and rapid visit of the customs for both countries interested, and which could only be arrived at by means of a joint station.

The concentration of successive operations relating to customs on one platform and having to provide one staff for the purpose in a single station are certainly incontestable advantages. Mr. Simon-Thomas convinced by the arguments advanced by Mr. Viglione agreed with him.

### Final summary.

« In order to facilitate the customs « formalities with international trains « and to reduce the time these trains have « to stop at the frontier stations, it is « recommended that :

« For trains fitted with inter-circula- « tion facilities the examination of the « luggage should be made on the journey, « and for other trains at the joint inter- « national station, either in the luggage « van if possible, or otherwise in its « proximity;

« In return for the facilities thus given « to passengers in international trains « with through communication, the col- « lection by the railway company of a sur- « tax or special rate should be authoris- « ed, the railway company being held « responsible for any supplementary « costs that may arise during the journey « as regards examinations by the customs « authorities;

« The examination of luggage in the « interior of the country, either for de- « parture or on arrival should be de- « veloped as far as it is possible to do so.

« It is desirable, in order to facilitate « the work of examination, both by the « railway companies and the customs, to « establish one joint station at the fron- « tier in preference to two. »

— The general meeting ratified this summary at its meeting of 28 April.

## QUESTION XV.

### Interchange of rolling stock.

Interchange of goods rolling stock (freight cars), and penalty charges in case of delay in the return of that stock :

*a*) Rules to be adopted in the relations between the railways themselves;

*b*) Rules to be adopted in the relations between the railways and the consignors and consignees.

### Preliminary documents.

1st report (America), by Mr. C. W. Crawford. (See English edition of the *Bulletin* of September 1921, p. 1275, or separate issue [with red cover] No. 31.)

2nd report (all countries, except America), by Mr. Charron. (See English edition of the *Bulletin* of March 1922, p. 479, or separate issue [with red cover] No. 61.)

Special reporter : Mr. Charron. (See English edition of the *Bulletin* of April 1922, p. 695.)

### Report of the 4th section.

(See *Daily Journal of the session*, No. 7, p. 11 and No. 8, p. 12.)

Mr. Charron (*special reporter*) gave a summary of the reports received.

Mr. Viglione (*Italian State*) was of opinion that the system of pooling international rolling stock would cause great difficulties and the system R. I. V. which proposes an individual settlement for each wagon is preferable.

Mr. Brisse (*French Eastern*) pointed out that formerly the ownership of wagons was considered by the companies to be of greater importance than the inconvenience caused by returning the said rolling stock uselessly empty.

At the present time railways have a tendency to reverse this and sacrifice the idea of ownership to that of reducing the running of empty stock in their interior traffic.

As regards international traffic in which the amount of interchanged rolling stock is relatively smaller, it would seem that the time has not yet come when the idea of ownership can be given second place.

Referring to the system of general pooling, he preferred the constitution of central distributing organisations.

Mr. F. Level (*French Light Railways*) referring to light railways, spoke in favour of the French system which consists in combining to a certain extent the stock of the large and adjoining secondary companies and crediting the owning railway with a daily hiring account equalling the number of wagons put into service by the latter and debiting it each day with a number of days equal to that of the wagons then running on its lines, a method which has the advantage of great simplicity.

Mr. Level desired that this should be recommended by the section.

Mr. Biraghi (*Italian local section*) supported Mr. Level's proposal.

Mr. Brisse disagreed with one of the conclusions in report No. 1, which requires that each railway company should furnish its share of stock in proportion to the volume of traffic leaving its lines. According to him, this supply should be limited to the traffic as far as their own lines are concerned. As regards secondary lines, he considered that the placing of rolling stock at their disposal by the larger companies according to the requirements of the smaller lines is preferable to a system of pooling.

Mr. F. Level pointed out the necessity of simplifying as much as possible interchange accounts. He allowed that a certain amount of latitude should be given to newly established secondary railways, or those which have not sufficient stock for their own requirements.

Mr. Direz (*French State*) stated that the « Chemin de fer de l'Etat français » found that private companies as a rule have insufficient rolling stock, and that for this reason they limit its circulation to a radius of 50 km. from the joint station.

Mr. F. Level objected to the latter system, which he considered gave an opportunity of increasing the mileage of empty stock.

Messrs. Gufflet (*French Midi*) and G. Level (*French Light Railways*) upheld the principle of pooling the rolling stock, and agreed with the observations put forward by Mr. F. Level.

Mr. Direz gave particulars of the system put into operation when the French Etat and Ouest Railways amalgamated and which lasted for two years.

Experience proved that from the point of view of upkeep, as well as that of journeys made with empty stock, the pooling system was far the best.

After a discussion between Mr. Brisse and Mr. Viglione, the president, Mr. Paul, proposed to refer the question of settlement of the interchange of rolling stock to the next Congress.

As regards payment of costs for damage, the section considered it advisable to settle this in accordance with the R.I.V. rates as being the simplest, and already adopted by the French and Italian railways.

At the suggestion of Mr. Soulez (*French Northern*), and after a discussion in which Messrs. Charron, Direz, Brisse and Mereutza (*Roumanian State*) took part, the section considered it necessary to make such regulations so that railways which send their wagons away may *get back the kind* they require for their own traffic as soon as possible, as the compensation they would receive would not cover the inconvenience they would be put to in not being able to utilise the wagons themselves.

Mr. Mereutza then gave particulars concerning the charges made in Roumania for delays in the return of freight wagons, the Government having made special arrangements for this to be done as soon as possible.

Mr. Viglione pointed out that during or since the war similar regulations have been made by all the European governments, but they can only be considered of a temporary nature.

Mr. Soulez considered it of the first importance to find a general means to rapidly liberate the rolling stock.

Mr. Brisse thought that in order to get the best results, a very complete control should be made at the stations as regards consigners and consignees and also in seeing that the advice notes are forwarded expeditiously. The control system is better than that of giving bonuses for unloading. The French Eastern, which is very careful in seeing that the rolling stock is not kept idle, has obtained very good results from this method.

Mr. Viglione stated that in Italy bonuses are given to the men who unload the wagons at a certain rate.

Proceeding to the question of delivering or collecting wagons on private sidings, Messrs. Soulez and Brisse gave particulars of the means adopted in France to enforce their rapid return.

In particular cases, as for instance when the beetroot is gathered in, the railway companies, rather than leave the sugar manufacturers to their own initiative, place at their disposal special wagons and a competent official to take charge of the running arrangements.

Mr. Viglione also said that one of the means in operation in Italy for enforcing the rapid return of rolling stock was, in addition to charging the usual penalties for delay, to completely stop all delivery of further wagons. They also expect private firms to put down sufficient siding accommodation to accelerate as far as possible the return of the stock.

Examining the question of private owners' wagons, and after hearing the discussion between Messrs. Charron, Brisse, Paul and Mereutza, the section concluded that it was desirable to issue uniform regulations for this stock on the R. I. V. basis.

As regards this, Mr. Viglione informed the section that in Italy they are considering regulations which will to some extent complete those of the R. I. V. as far as the private owners' freight wagons are concerned. This scheme will be duly submitted, perhaps within a year, to the foreign administrations adhering to the R. I. V. convention.

Some of the speakers pointed out the necessity of having brakes fitted to private owners' wagons to enable them to run freely with international traffic, in which traffic only those wagons should be allowed which are fitted with screw brakes.

This regulation has already been adopted by certain railways for the admittance of private owners' wagons to run with their rolling stock.

Mr. Mereutza mentioned an arrangement peculiar to Roumania where private owners' wagons that have been in use for more than twenty-five years become the property of the Government.

The section examined the various ways for remunerating the services rendered by the owners of private wagons to railways. They agreed that remuneration depends on local conditions, and that it does not seem possible to give any general rules on the subject.

### Final summary.

« *A.* — With regard to the relations « of the administrations between themsel- « ves :

« *a*) Since the last discussion on this « subject at the Congress of 1892, new « suggestions have been agreed to so as « to make a better use of the rolling « stock, and in certain cases, to simplify « the settling of the interchange accounts, « especially abolishing the charge for « mileage and imposing a fine for wagons « that are delayed in their return. Cer- « tain of these conventions have adopted « the principle of applying penalties only « at the request of the delivering admi- « nistration. Many others have more or « less adopted the pooling system, whilst « some have tried to overcome the incon- « veniences of the latter by placing the « running of its stock under the control « of a central office with the necessary « powers to enforce its orders.

« The principle on which these new « regulations are based are rational, but « some of them among which are the « most important, are of recent applica- « tion and it will be some years before « their practical value can be proved.

« As regards more particularly the in- « terchange between the big railways and « those of local interest, a new type of « agreement has recently been put into « operation which comprises a type of « pooling of the stock and a method of « adjusting the accounts having the ad- « vantage of great simplicity. The small « line is daily credited with a number of « days hire equal to the number of its

« wagons it has put in service, and is « debited with the number of days equal « to that of the wagons running on the « lines. This system appears to be parti- « cularly recommendable.

« *B*. — As regards relations between « railway companies and consigners or « consignees.

« *a*) The considerable differences be- « tween one country and another as re- « gards loss of time in loading and un- « loading wagons, proves that in some « countries they might make a better use « of the rolling stock, thus giving more « room at their stations, and at the same « time favour the interests of the cus- « tomers of those railways.

« *b*) The system of charging an increas- « ing percentage every day in case of loss « of time due to delay in loading and un- « loading the wagons has proved its value « and ought to be adopted generally.

« *c*) It seems desirable that, for the in- « terchange of private owners' stock, the « regulations should be as uniform as « possible. »

The section also gave its opinion that :

« It is desirable that this question « shall be carried forward on to the pro- « gramme of the next international con- « gress in the following terms :

« Interchange of goods rolling stock :

« *a*) Regulations to be adopted in inter- « national relations;

« *b*) Regulations to be adopted between « the large railways of the same country;

« *c*) Regulations to be adopted between « the large railway companies and those « of local interest;

« *d*) Regulations for the interchange of « private owners' goods rolling stock. »

— The general meeting ratified this summary at its meeting of 27 April, and referred it to the Permanent Commission to act accordingly.

## QUESTION XVI.

### Workmen's dwellings.

How is the problem of dwellings for their workmen and lower-grade employees solved by the railways ? How do the administrations assist the individual efforts made by the staff, particularly as regards the building of dwellings for the use of labourers and employees?

#### Preliminary documents.

1st report (America), by Mr. A. F. Banks. (See English edition of the *Bulletin* of July 1914, p. 595, or separate issue [with red cover] No. 1.)

2nd report (all countries, except America), by Mr. F. Lolli. (See English edition of the *Bulletin* of February 1922, p. 359, or separate issue [with red cover] No. 60.)

Special reporter : Mr. F. Lolli. (See English edition of the *Bulletin* of April 1922, p. 706.)

#### Report of the 4th section.

(See *Daily Journal of the session*, No. 6, p. 13 and No. 7, p. 12.)

Mr. Lolli (*special reporter*) and Mr. Zutter (*Swiss Federal*) gave a summary of the reports sent in by the various reporters.

Mr. Barnwell (*North Staffordshire Railway*) was of opinion that it is better to leave to private enterprise the building of dwellings for railway employees. In England, authorities never interfere, except in case of absolute necessity.

Mr. Ball (*London & North Western Railway*) supported Mr. Barnwell, alleging economic reasons on the part of railway administrations.

Mr. Soulez (*French Northern*) considered that all questions relating to workmen's dwellings are questions of expediency. The French Northern Company found itself compelled to provide 11 000 dwellings. It would have been unable to wait for, or count on, the help of private enterprise.

According to Mr. Mereutza (*Roumanian State*), the situation in Roumania is somewhat peculiar. In order to provide the staff necessary to run the railways, the State was obliged to ressort to special measures. It built dwellings for the higher as well as for the middle and lower grade employees of the railways. In order to cover this heavy expenditure, it imposed an increased rate of 5 % on all transport, and 60 % of the profit was devoted to the building of dwellings for the staff.

While acknowledging that it would be better to leave the initiative of building to private enterprise, Mr. Direz (*French State*) declared that in France it is impossible for the administrations to avoid taking it on themselves. He was of opinon that it is better for the administrations to build the necessary houses and so keep the working staff of the line together, instead of scattering it in the suburbs of big centres.

Mr. Delaluque (*Greek State*) said that as regards Greece, the special features of the country and the sparseness of its population compel the administration to provide lodging accommodation for the whole staff.

A discussion on the subject of State intervention by legislation respecting workmen's dwellings then took place, in which Messrs. Soulez, Dreyfuss (*French State*), Desroys du Roure (*Province of Sante-Fe Railway* [*Argentine*]) and Dejean (*French State*) took part.

From this discussion it was concluded that within the legal requirements of each particular case it was better for railway administrations to agree to construction by private initiative, either by individual contractors, or by means of co-operative associations of the staff. Most of the speakers were of opinion that it is in the interest of railway companies to encourage building societies in which the staff are interested, in spite of the somewhat numerous inconveniences arising from the procedure, from the point of view of free disposal or shifting of the workmen, who would naturally prefer stopping in their own property.

As regards the type of dwelling that might be recommended, it appeared from the discussion that it would be better to build small houses containing four flats, than huge barracks containing a much larger number. As far as possible the tenants should be provided with a small plot of ground for cultivation and keeping poultry. This arrangement is greatly appreciated by the employees, and benefits the administrations by tending to keep its staff both morally and physically in good health.

Mr. Genovesi (*Italian State*) then explained the method by which the housing question had been solved in Italy.

### Final summary.

« It is desirable that each employee
« should have a healthy and conveniently
« arranged dwelling consisting of not
« less than four rooms.

« It is desirable that, when necessary,

« administrations should provide these « dwellings for their employees.

« With a view to arranging for this, « it is in the interest of the administrations to act with private societies « (either with or without State assistance « according to laws and customs of the « various countries) whose business it is « to build these dwellings, and to make « the necessary financial arrangements « with them for the purpose. It would « also be an advantage for the companies « to encourage the formation of building « societies amongst their staffs.

« It is desirable that railway administrations should take special care to « provide suitable accommodation for « those entrusted with work connected « with the safety of the line and who are « unable to find it in the immediate « vicinity of their occupation. »

— The general meeting ratified this summary at its meeting of 27 April.

# SECTION V.

## Light railways.

*President* : F. Tajani.

*Vice-Presidents* : H. Caufriez and R. Peironcely.

*Principal secretary* : F. Level.

## QUESTION XVII.

### Carriages and wagons for light railways.

Types of carriages and of wagons for narrow gauge railways. Special wagons for facilitating unloading, transhipment and change of gauge.

#### Preliminary document.

Report, by Mr. C. Gaviraghi. (See English edition of the *Bulletin* of December 1921, p. 2075, or separate issue [with red cover] No. 49.)

Special reporter : Mr. C. Gaviraghi. (See English edition of the *Bulletin* of April 1922, p. 711.)

#### Report of the 5th section.

(See *Daily Journal of the session,* No. 3, p. 5.)

The reporter Mr. C. Gaviraghi summarised his views on the question, after which, on the invitation of the President, a discussion ensued on the subject and the conclusions submitted.

Mr. Lanzerotti (*Italian Government*) remarked that in addition to lines of 60 per 1 000 maximum gradient, there are adhesion lines of as much as 80 per 1 000, worked electrically without any difficulty.

He added that it would be well to consider also the standardisation of gauge.

The President said that this question was connected with that of standardisation of rolling stock.

#### Motion.

Mr. Biraghi (*Italian State*) made some general observations relating to the preliminary consultations necessary to obtain reports.

He pointed out that the majority of light railway companies have a mileage of less than 100 km. (62 miles) which prevents their becoming members of the International Association.

Still it would in many cases be interesting to collect from them information which might often be useful for longer lines.

He proposed that they pass a resolution to the effect that the Associations of each country should in future be requested, either by the Permanent Commission or by the reporter to consult their members and communicate a summary of their replies.

Mr. F. Level (*principal secretary*) said that in his capacity of president of the French Union he entirely agreed with this idea.

THE PRESIDENT said that he would communicate this resolution to the Executive Committee, asking them to give it full consideration.

### *Discussion proper.*

Mr. DE SOUZA (*Portuguese Government*) explained the process of development in Portugal; on the question of gauge, he strongly favoured a standardisation which would more easily allow the completion of their programme.

Mr. FORGES DAVANZATI (*Italian Federation of Transport*) called the attention of the section to the proposed summary, the wording of which should not in any case be contrary to the interests of lines already in operation, by involving them in expenditure which they could not meet.

Mr. F. LEVEL said that agreeing with the previous speaker he had drafted a resolution No. 1, which seemed to him to meet the views expressed; he read the draft to the section, and after discussion in which Messrs. SAPIN (*Chemins de fer d'intérêt local de l'Yonne, France*), FORBES (*County Donegal Joint Committee*), DE SOUZA, TSANG OU (*Chinese Government*) and MARGUERAT (*Viege Zermatt Railway*) took part, the resolution was put by the President and adopted.

THE PRESIDENT enquired if there were any remarks on the second paragraph of the summary.

Mr. FORGES DAVANZATI proposed a wording which would bring it into conformity with the first paragraph.

The text was adopted, with an addition suggested by the PRESIDENT and Mr. MARGUERAT, with the object of making it clear that standardisation should include electric equipments.

After discussion in which Messrs. F. LEVEL, SAPIN, SÜSS (*Madrid, Saragossa & Alicante*), NATOLI and GHISI (*Circumetnea Railway*) took part, and a statement by the REPORTER that he agreed, it was decided, on the proposal of the PRESIDENT, to omit the third resolution.

The section accordingly decided to submit to the general meeting the following summary :

### Final summary.

« 1° Standardisation of type for light « railway is recommended and should be « provided for by law in all countries in « the case of new lines : the legal pro- « posal being considered and presented « by the Associations or Unions of Com- « panies concerned in each country;

« 2° The Associations or Unions would « benefit by adopting uniform standards « for light railways and by investigating « types of rolling stock and locomotives « (including electric equipment), which « would be suitable to the most usual « conditions of working.

« These investigations, which should be « made in collaboration with manufactur- « ing firms, would assist in mass pro- « duction. »

— The general meeting ratified this summary at its meeting of 26 April.

## QUESTION XVIII.

### Operation of light railways. Working rules and regulations.

General simplifications to be considered in the operation of light railways. Special methods for collecting fares;

issue of tickets at booking-offices, before starting; issue on the trains; different types of tickets; auditing systems.

### Preliminary documents.

Report, by Mr. F. Level. (See English edition of the *Bulletin* of October 1921, p. 1471, or separate issue [with red cover] No. 34.)

Special reporter : F. Level. (See English edition of the *Bulletin* of April 1922, p. 714.)

### Report of the 5th section.

(See *Daily Journal of the session*, No. 7, p. 15.)

Mr. F. Level summarised his report and expressed the hope that there would be a good discussion.

After a discussion, in which a considerable number of the members present took part, the following summary was adopted :

### Final summary.

« 1° In the difficult circumstances in « which light railways are now being « worked, it is absolutely necessary to « take every means possible to enable « them to exist.

« With this object, in addition to direct « financial help, which is necessary in « most cases, Authorities granting conces- « sions should be requested to co-operate « by legislation tending towards simpli- « fication of working and the reduction « of working expenses to the minimum : « for instance, reduction of the number « of trains and of passenger classes, leav- « ing certain level crossings unmanned, « suppression of fraudulent travelling by « the institution of fairly heavy fines « immediately recoverable, etc.;

« 2° As regards the adoption of a « general method for working these lines, « it is important to remember the great « differences between the conditions of « labour on main line and subsidiary « systems.

« It is, therefore, desirable that Govern- « ment intervention, when necessary, « should be carried out with extreme care « in order to avoid raising working « expenses to an impossible point. The « satisfactory working of the lines can « only be carried out by giving the Com- « panies the utmost possible freedom in « such matters as the fixing of rates and « fines, etc. »

— The general meeting ratified this summary at its meeting of 26 April.

## QUESTION XIX.

### Special methods of traction on light railways.

Special methods of traction applied on light railways. Results obtained.

### Preliminary documents.

1st report (America), by Mr. H. B. Spencer. (See English edition of the *Bulletin* of September 1920, p. 571, or separate issue [with red cover] No. 7.)

2nd report (all countries, except America), by Mr. P. Biraghi. (See English edition of the *Bulletin* of November 1921, p. 1811, or separate issue [with red cover] No. 41.)

Special reporter : Mr. P. Biraghi. (See English edition of the *Bulletin* of April 1922, p. 719.)

### Report of the 5th section.

(See *Daily Journal of the session,* No. 7, p. 15.)

Mr. Biraghi read a summary of his report, after which a most interesting discussion arose regarding special systems of traction other than steam.

The following summary was finally adopted :

### Final summary.

« It appears, from information received from several Companies in America « and in Sweden, that the principle of « coupling an internal combustion engine « to a dynamo, and working the train by « means of electric motor, allows in some « cases the heavy expense of electrifying « the line to be avoided.

« It seems necessary, however, to await « the installation of this system in other « European countries in order to consider « how it affects working expenses and « financial results. »

— The general meeting ratified this summary at its meeting of 26 April.

## QUESTION XX.

### Safety appliances on light railways.

Cheap appliances for ensuring safety on light railways.

### Preliminary documents.

1st report, by Mr. S. de Kareischa. (See English edition of the *Bulletin* of March 1921, p. 247, or separate issue [with red cover] No. 13.)

2nd report, by Mr. A. Bonnevie. (See English edition of the *Bulletin* of October 1921, p. 1539, or separate issue [with red cover] No. 37.)

Special reporter : Mr. A. Bonnevie. (See English edition of the *Bulletin* of April 1922, p. 723.)

### Report of the 5th section.

Mr. Bonnevie summarised his report and gave the results of some supplementary experiments which had been carried out.

A discussion and exchange of views took place in which the following were the principal speakers : Messrs. Philippe (*Nord-Belge*), F. Level, Forges Davanzati (*Italian Federation of Transport*), de Souza (*Portuguese Government*), Wood (*Pennsylvania Railroad*), Thonet (*Lombard and Roman Tramways*) and Michaut (*French General Association of Light Railways*). The following text was adopted :

### Final summary.

« 1° The safety of trains on light rail- « ways is adequately provided for by the « ordinary brakes at present in use, but « for exceptional speeds continuous « brakes are recommended, in certain « cases, for passenger trains;

« 2° Special arrangements need not be « made for the protection of level cross- « ings except in exceptional circum- « stances;

« 3° For lines over which trains are only « run at low speeds the safety methods « adopted for the protection of the sta- « tions need, in general, only be very « simple. The running of the trains may « be controlled by telephone, staff, elec- « tric bells, etc.

« When, however, there is a section in « which a single line has several branches « running on to it, it is always desirable « to have a complete and effective con- « trol. Where possible such control « should be effected without the services « of a signalman in a box;

« 4° The points giving access to the « principal line ought to be locked in a « simple and sure manner;

« 5° Interlocked catch points may be « fitted on light railways at places where « there is a level crossing over main lines « carrying heavy traffic. »

— The general meeting ratified this summary at its meeting of 28 April.

## SPECIAL SECTION.

# DISCUSSION ON WORDING OF NEW RULES AND REGULATIONS.

*President* : Mr. V. Tondelier.

*General secretary* : Mr. J. Verdeyen.

*Preliminary document* :

Report by Mr. J. Verdeyen, secretary of the Permanent Commission.
(See English edition of the *Bulletin* of February 1922 or separate issue No. 57.)

*Present* : Mr. Tondelier, *President;* Messrs. Colson, Gerard, Behrens, Bruneel, Evelyn Cecil, de Cornè, Corteil, de Rechter, Hanrez, Heurteau, Mauris, Philippe, Tajani, Watson, Franza, Alessandri, Level, Krayenhoff, members of the special section; Messrs. Braem, Verdeyen, Holemans, Habran, Desprets and Minsart, members of the Secretariat of the Permanent Commission, attended the meeting.

The President explained the chief alterations proposed to the text attached to the report prepared in view of the meeting of the Congress. He put forward a modified reading of the first four articles.

Article 1.— The new wording proposed to bring back the old title of the Association. This title, the « International Railway Congress Association », sets out in a better way the principle object of the Association which is the holding of periodical Congresses. The permanency of the Association and its *Bulletin* are directed towards this object.

Mr. Gerard thought that the old title ought to be retained as it caused very great interest to be taken in the *Bulletin*, which is an unique publication of its kind.

Mr. Tajani proposed that the title be « The International Association for Advancement of Railways ». He thought, in fact, that the Association ought to have other objects besides its Congresses and Bulletin.

Mr. Colson strongly supported the suggestion made by the President for adopting the new title proposed.

After a discussion in which Messrs. Tondelier, Colson, Gerard, Bruneel, Heurteau and Hanrez took part, article 1 was voted upon with the result that the title « International Railway Congress Association » was adopted by 14 votes to 5.

Article 2. — A discussion arose with regard to the third paragraph.

Mr. Colson agreed that it was to the advantage of the Association to exclude small railways which were not in a position to carry out interesting experiments or able to make any useful contribution to the Congress from a technical point of view. The participation of these railways with meetings of the Congress only increased to an excessive degree the number of delegates.

Mr. TAJANI asked what would be the position of the Administrations which already belonged to the Congress.

THE PRESIDENT pointed out that in 1906 Administrations having a mileage of less than 100 km. (62 miles) had been allowed to retain their membership, but at that time the special Association for light railways and tramways did not exist. He thought our Association ought to remain a scientific one. The small railways were unable to advance the cause of railway science unless they had a traffic which rendered technical improvements financially and materially possible.

Mr. TAJANI spoke on behalf of the railways which already belong to the Association and asked that he might be supplied with a list of these.

THE PRESIDENT stated that there were 51 companies each operating less than 200 km. (124 miles), having a total mileage of 9 000 km. (5 600 miles), whilst the mileage of the railways of the whole Association was 400 000 km. (250 000 miles).

It was decided by 16 votes to 1 that the companies who did not comply with the new conditions of admission should cease to belong to the Association.

The section afterwards decided by 8 votes to 5 to admit railways with a mileage under 200 km. (124 miles) if their receipts per annum were at least 15 000 000 francs in gold (£ 60 000 or 3 000 000 dollars).

A proposal was made that the minimum receipts should be 20 000 000 francs; the voting on this was the same for acceptance and rejection, and it was not, therefore, carried.

ARTICLE 3. — Paragraph 1 was accepted without discussion.

Mr. HEURTEAU proposed the elimination of paragraph 2 which would allow into the Association bodies whose object was not that of the Congress, which was the perfecting of technical means of working railways.

Messrs. HANREZ and WATSON supported this view which was adopted.

Mr. F. LEVEL supported the view expressed in the 3rd section of maintaining at the Congress at least associations or unions of societies which, taken alone, have not the necessary development to qualify them for the new statutes.

Mr. COLSON proposed to admit unions of societies directly working railways by mechanical means and comprising a total of at least 1 000 km., not however including those worked by societies already forming part of the association.

The second paragraph of article 3 altered to meet these conditions was adopted.

Paragraph 3 was also made to include societies directly connected with the working of railways having more than 10 000 km.

ARTICLES 4 and 5 (3 and 4 of the draft), were adopted subject to verbal alteration only.

ARTICLE 7. (6 in the draft.) — It was decided that the number of members of the Permanent Commission should be fixed by each Congress.

Article 8. (7 in the draft.) — Mr. Colson proposed that there should be added to the fourth paragraph, after « a government or with a railway administration », the words « *to whom they shall belong at the time of their election* ». This was agreed to.

Articles 9 and 10 (8 and 9 in the draft), were agreed to without discussion.
Article 11. (10 in the draft.) — It was decided to leave to each Congress the fixing of the time and place of the following session.

Article 12. (11 in the draft.) — Mr. Heurteau proposed an addition to the second paragraph in order to prevent it being misused. This was agreed to.

Articles 13, 14 and 15 (12 to 14 in the draft), were adopted with the insertion of amendments intended to reduce the total number of delegates, bearing in mind the necessity of giving to large railways which may be amalgamated, representation in keeping with their importance. The maximum number for one administration was raised from 12 to 15.

Article 16. (15 in the draft.) — Mr. Heurteau remarked that the instructions to the sections which provided for a vote on the conclusions did not agree with the text of article 15, which said that the reporter should present a summary « without conclusions ».

Mr. Heurteau insisted on this rule being retained. After discussion the Commission agreed to the suggestion of Mr. Heurteau, which is confirmed also by the provisions of the penultimate paragraph of article 17 (16 in the draft) which reads thus :

« The Congress shall vote only on questions of the rules or matters relating to the organisation of the Institution. »

Article 17 (16 in the draft), was adopted.

With regard to the points dealing with translations now shown in the proposed text, it was agreed to continue certain proceedings which practice has shown to be useful.

Article 18. (17 in the draft). — Since the war the expenses have greatly increased owing to the high price of paper, printing, etc.; generally the charges are now four times what they were. However, owing to a fresh contract which has been entered into for printing the *Bulletin*, and other methods taken by the staff to reduce expenditure to a minimum, it will be sufficient if the subscription is fixed at double what it was in pre-war times. (This was 100 francs plus 25 centimes per kilometre of track.)

Article 18 amended in this way was adopted.

Articles 19 to 25 were adopted without discussion.

The special section proposed to submit to the general meeting the following definite draft of the rules and regulations:

### Object and composition.

Article 1. — The object of the International Railway Congress Association is to promote the progress of railways by the holding of periodical Congresses and by means of publications.
The headquarters of the Association are at Brussels.

Article 2. — The Association is composed of administrations directly working railways of public utility in the countries which have joined the association.

It comprises the administrations mentioned in the appendix to these rules and regulations.

The list of the countries comprised in the Association is given in the Appendice. This list can be varied by the Congress by the method laid down in article 21 dealing with the alteration of the rules.

Other administrations may be admitted under conditions prescribed by article 5, provided that :

1° their main object be the working of railways operated by mechanical means and open for public traffic in the countries to which the Association extends;

2° the other work on which they are engaged is such as is looked upon as accessory to railway operation;

3° their system has a length of at least 200 km. (124 miles); other administrations however that work a system having a length of from 100 to 200 km., may be admitted if their gross annual working receipts are equivalent to at least fifteen million gold francs per annum.

Article 3. — The following may join the Association :

1° Governments of the countries to which it extends;

2° Permanent Associations or Unions of Companies directly working railways operated by mechanical means, which include at least 1 000 km. (621 miles) of lines not yet represented in the Association;

3° Companies directly working regular services on at least 10 000 km. (6 200 miles) of lines.

### The Permanent Commission.

Article 4. — The Association acts through a Permanent Commission composed of members nominated according to article 7 and sitting at Brussels.

Article 5. — The Permanent Commission can, by written vote, giving a majority of three quarters of the total membership, provisionally alter the list of countries belonging to the Association subject to ratification by the next Congress.

It decides on the applications for admission. It can provisionally agree to the application of administrations, associations or unions belonging to countries adding them provisionally on the list.

It arranges for the removal from the list of the association of any member or adherent who ceases to comply with the foregoing requirements, who goes into liquidation or becomes bankrupt or who has failed to pay the subscription due for more than two fiscal years.

Article 6. — The Commission organizes the Congress meetings, prepares an agenda for discussion and is responsible for their preliminary treatment, edits and publishes reports of the discussions, draws up a balance sheet, fixes, subject to article 18, the amount of the annual subscriptions, is responsible for the finances, initiates enquiries and issues reports or other publications which will, in its judgment, further the objects of the Association.

Article 7. — The Permanent Commission shall be composed of ex-presidents of the sessions of the Congress, ex-officio members, and elected members whose number is fixed by each Congress.

The elected members shall be, as far as possible, chosen to represent the different nationalities. Under no circumstances shall any one nation have more than nine elected members.

One third shall retire at each Congress and are eligible for re-election.

A member who has ceased to hold office under a government, or with a railway administration, represented in the International Railway Congress Association with which he was connected at the time of his election, shall cease to be a member of the Permanent Commission. It shall be the duty of such a member to at once inform the president of such retirement. The Permanent Commission may, upon the application of five members, with the consent of the majority of all its members consulted by letter, ask him to remain until the next Congress.

The Commission shall always have the power to complete its number by co-opting delegates of the participating administrations and adherent governments. In this case the election shall be subject to confirmation by the following Congress.

When the place of meeting of a Congress has been fixed, the Permanent Commission shall have power to co-opt as temporary members representatives of the country in which the Congress is to be held.

Article 8. — The Permanent Commission shall elect from among its members a president and two vice-presidents at its first meeting after each Congress of the Association.

The president and the chief vice-president shall be chosen from the Belgian members.

The Commission shall appoint a general secretary, secretaries and a secretay-treasurer. As such they shall have the right to take part in discussions, but not to vote.

The Commission shall be summoned by the president if and when the business of the Association requires it, but in any case at least once a year.

Any five members may require a meeting to be called.

Questions shall be decided by the votes of the majority of members present. If the votes are equal, the Chairman shall have the casting vote.

Minutes shall be kept of the proceedings of the Commission. Nine members shall form a quorum.

If at a first meeting this number is not present, no quorum shall be necessary for the transaction of business at the next meeting, which must be held not more than one month later.

Article 9. — The Association shall be represented in Courts of Justice and in all civil actions by the president, or in the event of his being unable to attend, by the general secretary of the Permanent Commission.

### Executive Committee.

Article 10. — At its first meeting after a Congress the Commission shall nominate three of its members to form, together with the president and the vice-presidents of the Commission, an Executive Committee.

The President of the Permanent Commission shall also be president of the Executive Committee.

The general secretary, the secretaries and the secretary-treasurer of the Commission shall be members of the Committee and shall have the right to take part in discussions, but not to vote.

The members of the Executive Committee shall hold office for a period equal to the interval between two Congresses. They shall be eligible for re-election.

The Executive Committee shall be summoned either by the president on his own authority or on the requisition of three members.

The Committee shall be responsible in particular for the management of current affairs and for financial business; also for superintending and managing investigations, reports and publications; for the editing of the *Bulletin* and for the care of the library and archives. It shall decide as to printing in whole or in part the reports and other documents submitted to a Congress, the circulation of which it regards as necessary to facilitate the discussions. It shall be the duty of the Committee to furnish members of the Association with such special information as they may require.

The Committee shall have the right to appoint and to dismiss the staff.

The carrying out of the decisions of the Committee is entrusted to the president and the general secretary.

### Congresses.

Article 11. — The Association at each Congress shall fix the time and place for the following Congress.

However, the Permanent Commission shall have power to modify these arrangements under exceptional circumstances.

Article 12. — The following shall have a right to attend the meetings :

1° The members of the Permanent Commission, the secretaries and the treasurer;

2° Delegates appointed by the participating administrations and the adhering governments.

They must belong to the regular and permanent staff of the Administration or of the adhering government, delegating them;

3° The secretaries of sections and the reporters appointed by the Commission or its Executive Committee to report on the items on the agenda.

Article 13. — The participating Railway Administrations shall be entitled to nominate up to fifteen delegates, according to the mileage of their system in the following ratio :

One delegate for lines of not more than 311 miles (500 km.);

One additional delegate for each additional 311 miles or fraction thereof for lines above 311 miles up to 1 864 miles (3 000 km.);

One additional delegate for each additional 621 miles (1 000 km.) or fraction thereof for lines above 1 864 miles up to 3 728 miles (6 000 km.);

One additional delegate for each additional 1 864 miles or fraction thereof for lines above 3 728 miles.

The adhering governments may also nominate fifteen delegates as a maximum in the proportion of one delegate for each 400 fr. subscription up to 2 000 fr., and one additional delegate for each 1 000 fr. over 2 000 fr.

The maximum figures quoted above do not include those members who take part in the Congresses, as per article 12, and whom the participating administrations or adherent governments include amongst their delegates.

All delegates participate in the Congresses with equal rights.

Delegates can, however, only be sent to the Congress by those members or adhering governments who have belonged to the Association for 3 years or have paid the prescribed subscription for this period.

Article 14. — At the opening of each Congress, the officers of the Permanent Commission shall hold office temporarily until the Congress has elected its own officers as follows :

1° One or more honorary presidents and vice-presidents;

2° One president;

3° Presidents of sections elected as explained in article 15:

4° One or more general secretaries and one or more assistant general secretaries.

The delegate nominated first by each government shall be an ex-officio vice-president.

All officers shall be appointed for the duration of the session.

The election shall take place according to the rules laid down in article 17, paragraph 6. The duties of the officers shall be those laid down by standing orders adopted by « deliberative assemblies » for the conduct of their proceedings.

After the appointment of the officers, the Congress shall divide into sections, according to the arrangements of items on the agenda submitted by the Permanent Commission.

A member may enter his name for more than one section.

The Congress may also appoint special committees to investigate certain questions.

ARTICLE 15. — Each section or committee shall appoint its own president, its own chief secretary and its secretaries The presidents of sections shall be officers of the Congress in virtue of their position.

The sections and the special committees shall cease with the termination of each session.

ARTICLE 16. — The discussions of the Congress shall be confined to the questions that are decided upon by the Permanent Commission, due regard being had to the wishes of the preceding Congress and its sections.

The Commission shall receive suggestions from the participating and constituent bodies. A reporter appointed by the Commission shall prepare a brief outline of each question without expressing conclusions, and also a summary of the contents of the documents which have reached him.

No question shall be discussed at a general meeting without having been first considered by a section or special committee.

ARTICLE 17. — The discussions shall be conducted in French or in the language of the country in which the Congress is held. Speeches in any other language shall be translated into French.

The minutes and reports shall be drawn up in French, but at the request of the speakers their original words are printed side by side with the translation.

The officials of the respective sections shall draw up an abstract of the discussions setting forth the various opinions expressed in the section. After receiving the approval of the section these abstracts shall be submitted to the general meeting. They shall then be inserted in the minutes after having been completed by the addition, if necessary, of any new opinions expressed at the general meeting itself.

The Congress shall vote only on questions of the rules or matters relating to the organisation of the Institution.

On these special questions, the votes of the majority of the members present shall be taken by members rising in their places. If there is any doubt, the votes shall be counted.

A ballot shall not be taken except at the request of not less than twelve members.

### Subscriptions and auditing of accounts.

ARTICLE 18. — The expenses of the Congresses, of the Permanent Commission and of the Executive Committee shall be covered by :

1° The annual subscriptions of members;

2° Subsidies and other casual receipts.

The annual subscriptions shall consist of :

*a*) In the case of adherent governments, unions and companies, an amount fixed by themselves;

*b*) In the case of participating administrations, a fixed sum of 200 fr., plus a sum proportionate to the mileage of the system. This variable sum shall not exceed 50 centimes per km.; its amount to be fixed by the Permanent Commission.

The financial year shall begin on the 1 January.

ARTICLE 19. — Payment of the subscriptions shall entitle the participating administrations and adherent governments to receive free as many reports of the proceedings as the number of their delegates.

Any other publications of the Association shall be sent to the subscribing administrations in numbers based upon the number of their delegates, in conformity with article 13 plus one.

Article 20. — The Permanent Commission shall present to each Congress a report on the financial position. The Congress shall appoint two auditors to pass the accounts.

### Revision of the constitution, dissolution and liquidation.

Article 21. — Every proposal for a revision of the rules must be submitted to the Permanent Commission, with reasons in support of it, at least three months before the date fixed for the opening of the session, in order that it may be brought by the Commission to the knowledge of the members of the Association at least one month before that date.

The proposition cannot be discussed at a full meeting of the Congress, unless it has been agreed to either by the Permanent Commission, or if twenty-five members desire that the question shall be discussed.

In the first case, it shall be discussed on the report of the Permanent Commission, in the second case on the report of a special committee.

Article 22. — Adherent governments and participating administrations constituting the Association pledge themselves to promote the meetings of the Congress and the work of the Permanent Commission.

Article 23. — The Association can only be dissolved by a three quarters majority, on a postal vote from the participating administrations, each one having a number of votes equal to that of the delegates to which it is entitled.

Article 24. — In the event of dissolution, the Permanent Commission shall have authority to arrange the liquidation.

By its agency the assets of the Association are to be distributed among works conforming with the objects of the Association or among philanthropic works in connection with railways.

Article 25. — In no circumstances shall participating administrations and adherent governments, who for any reason have ceased to belong to the Association, have any claim on the assets of the Association.

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(See, p. 1184, the discussion at the general meeting of 27 April 1922.)

# SUMMARY REPORT OF THE DISCUSSIONS

## AT THE GENERAL MEETINGS

(26, 27 and 28 April 1922).

*President :* Mr. DE CORNÉ, honorary vice-president.
*General secretaries :* J. VERDEYEN; E. FRANZA; Sir HENRY FOWLER.
*Assistant general secretary :* N. GIOVENE.

At the opening of the general meeting on 26 April, Mr. DE CORNÈ delivered the following speech :

« Gentlemen,

« It is with considerable misgiving that I have accepted the honour of presiding at these important full sessions of the Congress at which we are to confirm the conclusions arrived at by the different sections.

« Others, far more competent than I am, could have been chosen for this honourable duty, but since you have chosen me for the post, I must say that I feel sincerely proud of the honour, and whilst thanking you from the bottom of my heart, I ask for your kind consideration.

« I remember the strenuous work of those anxious years — now happily a thing of the past — during which those in charge of the railways had but one object, that of making them serve in the best possible manner in the supreme effort required by the world's war. It is with a deeply felt satisfaction that I now see their activities directed in a peaceful direction. In the same way after a cataclism, the eternal and beneficient forces of nature resume their power and clothe with flowers and fruit the scattered ruins; so it has come to pass that at last after the troubles and strenuous work of war time when we strained every nerve to carry out exceptional work (which incidently caused a good deal of damage to the railways themselves) we can today, after the re-establishment of peace, turn to the quiet study of those improvements which tend to greater regularity, safety and economy in the working of our railways.

« Coming here from all parts of the world, you have brought to bear on the work and problems you have undertaken the great knowledge you possess, and everyone has noted with satisfaction the earnestness and interest that you have shown in discussing the various problems submitted to the Congress.

« Your learned reports, the data and information you have so kindly supplied with regard to the methods and works in your various countries, the experience you have attained in the important positions you occupy, have helped extremely important solutions of various questions to be arrived at, and these will help railway technical men over the whole world.

« The solution of these problems will make the Congress at Rome a memorable one in the annals of the International Railway Association, which is so well presided over by Mr. Tondelier, to whom I offer my sincere good wishes for the ever increasing prosperity of the Association.

« You know without my quoting them that twenty questions have been discussed during the present Congress.

« Our excellent General Secretary, Mr. Verdeyen, who with such interest and tact has contributed so largely to the success of the Congress, and who has been always present and ever ready to supply information, advice and assistance, will shortly read the conclusions proposed by the sections for each question, and I shall have the honour to submit them to you for your final approval.

« It may be that some of these conclusions may appear to you to be of too general a character, and some of you may wish to make them more definite. I feel that I should remind you of the excellent advice given by our Vice-President, Mr. Colson, in a recent paper of his on the present conditions of the International Railway Association, which has been widely appreciated. He reminded us that our Congress cannot fix any absolute rules on those questions whose solution often depends on local conditions and varies according to technical progress. It follows that our conclusions should be based on broad lines capable of being adopted, without causing much opposition, at our full sessions where every grade of opinion is represented and without those who support them feeling that future obstacles are being raised which will retard their action.

« These are the ideas which have actuated the various sections. Without wishing to raise any discussion, I shall be glad if those who have any point to raise will do so, and to put forward their proposals concisely and very briefly. It is understood that any point not referred to is approved. »

Mr. Verdeyen, *general secretary*, read the report of section 1 on question I, of section 2 on question VI, of section 3 on question IX and of section 4 on question XIII.

— The final summaries submitted by the sections not having raised any discussion they were ratified by the meeting.

The President read the following motion of Mr. Lanino (*Italian Government*):

### Railway statistics

Mr. Lanino, although fully aware of the difficulties of the problem, believes that it is in the interest of all concerned to have as great an uniformity as possible in railway statistics, at least in the bases by means of which comparison may be made between the various plant and work of the railways. The necessity of this was particularly shown in section 2, in dealing with the question of « Electric traction », when the view was expressed that it was desirable that a committee should be formed to deal with the question of standard statistics.

He put forward the following :

« The Congress having moved the interest which has been shown in the question of fundamental standard statistics which would allow of a correct comparison being made, by employing uniform figures, between the results of the various railways, express the view that the International Railway Association should move in the matter and request the Permanent Commission to nominate a special Committee to study the question and take the necessary

« steps to formulate a definite proposal « to be laid before the next Congress. »

— This motion was adopted.

Mr. Verdeyen read the report of section 5 on **question XVII** and of section 1 on **question III.**

— The final summaries on these two questions were adopted.

Mr. Giovene (*Italian State Railway*) put forward the following motion :

### Use of special steels for all technical railway purposes.

The question of special steels has been the object, at this Congress, of three very interesting reports which Mr. Mesnager has summarised with great clearness and moderation. The conclusions reached are definite as regards manganese steel and on the tempering of rails. With regard to the use of other special steels, the reporters appreciate the need to continue the investigations with the object of determining the exact conditions which necessitate the use of special steels, of improving their manufacture, and of ascertaining their relative value and the conditions under which they should be used.

This lays down a programme which the Association ought not to neglect. It ought to be agreed to so that at the next Congress one ought to be able to discuss fully the question of the use of special steels on railways from every point of view, that is to say, its use in all metallic structures, and above all for use in connection with bridges and rolling stock.

With regard to this last point, it is unnecessary to call attention to the especial suitability of these steels for the parts of mechanism which are subjected to high stresses, whether alternating or centrifugal, which parts may by this means be made lighter and therefore easier on the permanent way.

He proposed the following resolution :

« The Congress having noted the interest taken in the question of the use « of special steels in all technical railway « work, that is to say, for permanent way « (fixed materials) for metal structures « and for rolling stock, express the view « that the two following questions should « be included in the programme for the « next session of the Congress and should « be discussed at that Congress :

« 1° The use of special steels for permanent way (fixed materials) and for « metal structures, especially for bridges, « with the object of reducing their weight « and so allowing of the solution of problems which it is impossible when ordinary steels are used;

« 2° The use of special steels for rolling stock, and especially for certain « parts of steam locomotives and electric « locomotives, with the object of strengthening the parts subjected to high « stresses without increasing their dimensions and decreasing the weight of « parts subjected to alternating or centrifugal movement and consequently diminishing the injurious effects they « have on the permanent way. »

— This motion was adopted.

Mr. Verdeyen read reports from the 2nd, 3rd and 5th sections as follows :

2nd section, **question VIII**, the conclusions were ratified.

— The motion in the third paragraph of the summary was approved and referred to the Permanent Commission.

— The meeting also ratified the summary of the 3rd section on **question X**.

and of the 5th section on **questions XVIII and XIX.**

## General meeting, 27 April at 3.0 p. m.

### RULES AND REGULATIONS.

The President submitted to the meeting the suggested statutes of the Association drawn up by the special section and published in No. 7 of the *Daily Journal* (see page 1173 of the *Bulletin*).

Mr. Verdeyen pointed out certain alterations in the wording. The proposal submitted to the meeting only differed from that presented by the Permanent Commission in regard to articles 2 and 13 which dealt with the condition of admission and the number of delegates.

A long discussion followed in which Messrs. Ottone (*National Society of Italian Railways and Tramways*), G. Level, Michaut (*Society of Light Railways, France*), F. Level, Lanino, Biraghi, Thonet, Süss, Schiavon, Simonetti, Just and Scialoja, protested against the suggested alteration of article 2 and against the reduction in the number of delegates proposed by the new article 13, and in which Messrs. Tondelier, Colson and Verdeyen energetically defended the proposed alterations; the latter were rejected by the majority of the members present.

After a suspension of the sitting for a short time, Mr. Verdeyen proposed the adoption of the scheme similar to that he presented in the name of the Permanent Commission in his report, with the following alterations only :

1° The alterations of the working proposed by the special section to the different articles will be applied to the « definite » text;

2° That article 17 (subscriptions) will be replaced by article 18 of the suggestions of the special section.

— This proposal was adopted unanimously and the new statutes approved. The Permanent Commission was instructed to draw up the « definite » text.

Mr. Verdeyen read reports of the 1st, 2nd, 3rd and 4th sections as follows :

From the 1st section on **question II**; from the 2nd section on **question V**; from the 3rd section on **question XI** and from the 4th section on **question XV**, and their summaries were ratified.

— The motion presented by the 4th section at the end of the report on question XV was adopted and referred to the Permanent Commission.

— The summary of the 4th section on **question XVI** was also ratified.

## General meeting, 28 April at 9.0 a. m.

Mr. Verdeyen, *general secretary*, read the following reports of the 1st section on **question IV**, of the 2nd section on **question VII**, of the 3rd section on **question XII**, of the 4th section on **question XIV** and of the 5th section on **question XX**, and these summaries were ratified by the general meeting.

— The **motion** relating to the employment of liquid fuel by the 2nd section was also adopted and referred to the Permanent Commission.

### *A.* — Nomination of the members of the Permanent Commission.

The General Secretary, Mr. Verdeyen, read the names of the Permanent Commission, and the following proposals were adopted :

1° That Mr. Crova, president of the ninth session, be elected a life member of the Commission, and that Mr. de Cornè, honorary vice-president of the ninth session, who has acted as president of the general meetings, be also elected a life member of the Commission;

2° That the Permanent Commission of the new Association consist of forty-eight members allocated as follows :

| | | |
|---|---|---|
| Belgium | 9 | delegates. |
| China | 1 | — |
| Denmark | 1 | — |
| Spain | 2 | — |
| United States of America | 4 | — |
| France | 9 | — |
| Great Britain | 7 | — |
| Canada | 1 | — |
| Italy | 4 | — |
| Japan | 1 | — |
| Holland | 1 | — |
| Sweden | 1 | — |
| Switzerland | 3 | — |
| Rumania | 1 | — |
| Czecho-Slovakia | 1 | — |
| Poland | 1 | — |
| Egypt | 1 | — |

— This allocation was agreed to by the meeting.

3° The following be elected members of the Permanent Commission :

Messrs. Tondelier, Bruneel, Hanrez, Vander Rijdt, Foulon, Braem, Verdeyen, Caufriez and Philippe for Belgium;

Mr. Tsang Ou for China;

Mr. T. A. Alstrup for Denmark;

Mr. E. Maristany, marquis de l'Argentera, for Spain;

Messrs. R. H. Aishton, L. F. Loree and W. W. Atterbury for the United States of America;

Messrs. C. Colson, G. Griolet, E. du Castel, M. Fontaneilles, P. Riboud, J. R. Paul, P. E. Javary, Margot and A. Mange for France;

Messrs. J. R. Brooke, Lord Churchill, A. Watson, Sir Evelyn Cecil, Sir Guy Granet and G. Behrens for Great Britain;

Mr. H. G. Kelley for Canada;

Messrs. A. Alessandri, E. Franza, G. Grillo and F. Tajani for Italy;

Mr. L. M. Barnet Lyon for Holland;

Mr. C. Mereutza for Rumania;

Mr. A. Granholm for Sweden;

Messrs. Dr. R. Hérold, Zingg and G. Kunz for Switzerland;

Mr. E. Kejr for Czecho-Slovakia.

4° The Permanent Commission was instructed to arrange for the nomination of the delegates from Poland, Egypt and Japan, for the seventh British delegate, the fourth delegate of the United States and the second delegate for Spain.

### *B.* — Auditing of the accounts.

The President laid on the table the report of the auditors : Mr. Carlier of the Paris-Orleans Railway and Mr. de Tchérémissinoff of the Russian State Railway, who certified as correct the accounts from 15 April 1906 to 15 April 1911 (eight session). This report stated that the accounts had been properly kept and met with their approval.

The President also laid on the table accounts of management from 15 April 1911 to 31 March 1922.

Mr. Butticaz, secretary to the Management of the 1st division of the Swiss Federal Railways, and Mr. Barriol, chief accountant of the Paris-Lyons-Mediterranean Railway, were elected as auditors to deal with the accounts of the ninth session.

# CLOSING CEREMONY

On Friday 28 April 1922, at 10 a. m., the delegates assembled in the great hall of the Palace of Exhibitions. Mr. **Crova** took the chair; with him were Messrs. **Tondelier**, president of the Permanent Commission, **de Corné**, honorary vice-president, **Verdeyen**, **Franza** and **Fowler**, general secretaries of the ninth session.

### *A.* — Selection of meeting place for next session.

Mr. **Tondelier**, president of the Permanent Commission, stated that the Permanent Commission of the Association had provisionally entered into negotiations with the Spanish Government with a view to the next Congress being held in Madrid. The Government had informed them that it would be pleased to receive the Association in the capital of their country and to give our scientific and technical body the warmest welcome. It would accord to the members of the next Congress those facilities and hospitality which they had received in other countries, so that the Spanish session should compare favourably with the preceding ones. (*Loud applause.*)

Mr. **Tondelier** formally proposed that the next Congress be held in Madrid in 1927. (*Agreed with acclamation.*)

### *B.* — Closing of the Congress.

Mr. **Crova**, president, gave the following address :

« Gentlemen,

« The ninth session of the International Railway Congress has finished its work.

« I am glad to note the brilliant results of this meeting. Your assiduity in the general meetings and in the sectional ones, the order and fullness of your discussions, the importance of the subjects considered, have ensured the success of this magnificent renewal of activity on the part of our Association.

« This activity has never been interrupted; it did not however do any public work during almost five years of trouble and adversity. But the sovereign power of Faith has triumphed over all obstacles, and we have seen with sincere emotion that, during the twelve years which have passed since the last session held in Berne, our Permanent Commission has never rested in its efforts. Silently, unrestingly, notwithstanding the anxieties of a sad situation, it has worked for the preservation and also for the improvement of the Association so that, directly the clouds disappeared from the horizon, its organisation gave immediate proof of its strength and vigour.

« All honour, therefore, dear colleagues, to the Permanent Commission, and first and foremost to our illustrious president, Mr. **Tondelier**, to whom I express most sincerely our most profound gratitude and admiration. Nor can we, at the same time, forget our excellent general secretary, Mr. **Verdeyen** and his worthy collaborators, who have fulfilled their duties with such competency and with such extreme tact, nor our worthy treasurer, Mr. **Holemans**, who has even been a model of unwearying activity.

« I much regret that the shortness of the time at my disposal will not permit me to give the names of all those who have contributed so efficaciously to the success of the programme of the session which closes today. We offer our warmest thanks to the presidents and vice-presidents of sections, to the reporters, the delegates, to the gifted specialists who have prepared or directed your discussions or who have taken part in them.

« The publication of the *Daily Journal* has been carried out in the most perfect manner; we owe much gratitude to the department which has devoted itself to a work so important and difficult.

« I should have finished, dear colleagues, but that one last duty remains for me to carry out, perhaps the most sacred of all. The initiation of our work was honoured by the presence of His Majesty the King of Italy, and by that of the illustrious representatives of the associated governments. To the August Sovereign whom we have acclaimed here, to the Sovereigns and Heads of States who have been present in spirit at this event of world-wide importance, I propose to send the expression of our respectful and devoted homage.

« That homage, however, goes by right in the first place to old and glorious Belgium, cradle and centre of the Association. I propose to you to vote by acclamation and with our whole heart, a greeting to that noble country so worthy of admiration and sympathy :

Long live Belgium ! Long live King Albert !

« Gentlemen,

« In a few days you will be once again in your native land. I hope that the remembrance of our affectionate reception will remain in your hearts as a link of brotherhood, and that it will make you desire once again to see the beautiful sun of Italy. It is not therefore a farewell, but a cordial « au revoir » that I address to you, saying to you with sincere emotion : Friends, Brothers, do not cease to love us. » (*Loud applause.*)

Mr. Tondelier, president of the Permanent Commission, returned thanks in the following words :

« Gentlemen,

« Before we separate, I have a duty to fulfil in expressing once more the very deep sense of gratitude we feel to His Majesty the King for the signal honour he conferred on us in being present to take part in our opening meeting and in the interest he has shewn throughout in the work of our Congress.

« The Italian Government, through His Excellency the Minister of Public Works, has been good enough to be interested in our work, and we have received in its capital the warmest and most sympathetic welcomes.

« Through the reception at the Capitol, the Civic Authorities of Rome honoured us by receiving us in its historic palace with a courteousness and a cordiality which could not be surpassed.

« To all the authorities to whom we owe such a debt of gratitude, we offer from the bottom of our hearts our sincere gratitude.

« I know I am speaking on behalf of all the members of this Congress when I express the deepest sympathy which we feel with Mr. Crova, who in addition to having accepted the presidency of our sittings, has succeeded in giving them the impulse which has made the Congress at Rome exceed our expectations. If the work of the control of over 10 000 miles of railway, which has been especially exacting at the present moment, has not permitted him to take that active part in one work which he would have desired, he was supported in a most excellent way by our honorary vice-president, Mr. DE CORNÈ, who has presided at our general meetings in so charming a manner. They have both placed at the disposal of the Congress their rare ability, their tact and the charm of their characters. Their names will figure from now in the list of honour of the presidents of our sessions.

« I wish also to express on behalf of you all our thanks to the general secretaries, Messrs. VERDEYEN, FRANZA and FOWLER, to our treasurer, Mr. HOLEMANS, and to all their assistants for the energetic way in which they have worked in order that the work of the Congress might be carried out with perfect regularity.

« During the opening meeting I spoke of the excellent programme which the local Italian Committee had laid before the Permanent Commission for the session at Rome. Since then, experience has shewn us with what care they had arranged for our stay in this City, as well as the care they took to ensure the perfect success of the grand banquet to which the Government so kindly invited us on 19 April, also the unforgetable reception given us at the Capitol by the Municipality of the Metropolis.

« Our mission, however, is not finished; our stay in Rome augurs well for the excursions we are to pay to Naples and Genoa. It will only be at the end of our visit, when we are on the point of quitting Italian soil, that we shall be able to appreciate fully the thanks we owe to those who have carried out the arrangements for us.

« I can hardly express to Mr. ALESSANDRI and his assistants what we feel for all the trouble they have taken on our behalf, and I offer them our sincere thanks.

« I also offer our thanks to the gentlemen associated with the industrial work at Terni for the day so beautiful and yet so instructive which we spent in their neighbourhood. There side by side we found nature in its most beautiful aspect and an industry fully developed and prosperous.

Mr. President, you have thought well to address to the president and secretaries of the Permanent Commission eulogistic remarks, and I thank you for them very earnestly. As far as I am concerned myself, these words were too flattering and certainly not merited, but I accept them very cordially on behalf of those who are with me and whose zeal, devotion and hard work I am able to appreciate so much.

« I have to propose, gentlemen, that you show by acclamation the thanks we feel to our presidents, Mr. DE CORNÈ and Mr. CROVA, to those who have assisted them and to all who have contributed by their efforts and assistance to the ninth session of the Railway Congress. » (*Loud applause.*)

The president, Mr. CROVA, declared the working session closed, and wished the delegates who were joining the excursions to Naples and Genoa a pleasant time.

# PERMANENT COMMISSION

OF THE

## INTERNATIONAL RAILWAY ASSOCIATION

*elected at the General Meeting of the Congress on 28 April 1922, and at the Meeting held by the Permanent Commission on the same date (arts. 6 and 7 of the statutes).*

*President :*

V. **Tondelier** (1), administrateur-président honoraire, membre du conseil d'administration des chemins de fer de l'Etat belge; rue de Louvain, 17, Bruxelles.

*Vice-presidents :*

F. **Bruneel** (2), administrateur-président des chemins de fer de l'Etat belge; rue de Louvain, 17, Bruxelles;

C. **Colson** (2), membre de l'Institut, inspecteur général des ponts et chaussées, président de section au Conseil d'Etat de France; rue de la Planche, 2, Paris.

*Members of the Executive Committee :*

G. **Behrens** (3), director, Midland Railway; Chepstow street, 20, Manchester;

The Right Hon. Sir Evelyn **Cecil** (1), M. P., G. B. E., privy councillor, director, London & South Western Railway; Cadogan Square, 2, London, S. W. 1.;

**Griolet** (3), vice-président du conseil d'administration de la Compagnie du chemin de fer du Nord français; avenue Henri Martin, 97, Paris.

*Ex-presidents of the sessions, members ex-officio :*

S. **Fish**, director, Missouri, Kansas & Texas Railway; Wall Street, 52, New York;

R. de **Cornè**, ingénieur, président du conseil supérieur des travaux publics d'Italie; Rome;

C. **Crova**, ingénieur, directeur général des chemins de fer de l'Etat italien; Rome.

*Members :*

### Belgium.

V. **Tondelier** (already named);

F. **Bruneel** (already named);

C. **Hanrez** (2), administrateur des chemins de fer de l'Etat; Bruxelles;

H. **Vander Rijdt** (1), administrateur des chemins de fer de l'Etat; Bruxelles;

E. **Foulon** (3), administrateur des chemins de fer de l'Etat; Bruxelles;

A. **Braem** (3), inspecteur général des chemins de fer de l'Etat; Bruxelles;

J. **Verdeyen** (2), ingénieur en chef, inspecteur de direction aux chemins de fer de l'Etat; Bruxelles.

H. **Caufriez** (1), directeur général de la Société nationale belge des chemins de fer vicinaux; rue de la Science, 14, Bruxelles;

G. **Philippe** (3), inspecteur général des lignes Nord belges; Liége.

### China.

**Tsang Ou** (2), directeur général adjoint du chemin de fer du Lunghai; rue de Mogador, 5, Paris.

### Denmark.

T. A. **Alstrup** (3), directeur général des chemins de fer de l'Etat; GL. Kongevej, 1, Copenhague.

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(1) Retires at the 10th session.
(2) Retires at the 11th session.
(3) Retires at the 12th session.

### Egypt.

X*** (2) . . . . . . .

### Spain.

**Maristany** (3), marquis de l'Argentera, directeur général de la Compagnie des chemins de fer de Madrid à Saragosse et à Alicante; Estacion de Atocha, Madrid;

X*** (2) . . . . . . .

### United States of America.

S. **Fish** (already named);

R. H. **Aishton** (3), president, American Railway Association; South Dearborn Street, 431, Chicago, Ill.;

L. F. **Loree** (3), president, Delaware & Hudson Railroad; Nassau Street, 32, New York City;

W. W. **Atterbury** (1), vice-president, Pennsylvania Railroad; Broad Street Station, Philadelphia, Pa.;

X*** (1) . . . . . . .

### France.

C. **Colson** (already named);

E. **du Castel** (2), conseiller d'Etat, directeur général des chemins de fer au Ministère des travaux publics; boulevard Saint-Germain, 241, Paris;

M. **Fontaneilles** (2), inspecteur général des ponts et chaussées, président de la section des chemins de fer au conseil général des ponts et chaussées; rue de Sèvres, 4, Paris;

P. **Riboud** (2), directeur de la Compagnie des chemins de fer de l'Est; rue d'Alsace, 21, Paris;

J. R. **Paul** (3), directeur de la Compagnie des chemins de fer du Midi; boulevard Haussmann, 54, Paris (IX<sup>e</sup>);

G. **Griolet** (already named);

P. E. **Javary** (1), ingénieur en chef de l'exploitation de la Compagnie du chemin de fer du Nord; rue de Dunkerque, 18, Paris;

**Margot** (3), directeur général de la Compagnie des chemins de fer de Paris à Lyon et à la Méditerranée; rue Saint-Lazare, 88, Paris;

A. **Mange** (1), directeur de la Compagnie du chemin de fer d'Orléans; rue de Londres, 8, Paris.

### Great Britain.

J. R. **Brooke** (1), C. B., principal assistant secretary, Ministry of Transport; Whitehall Gardens, 6, London, S. W. 1.;

Lord **Churchill** (1), G. C. V. O., chairman, Great Western Railway; Paddington Station; London, W.;

A. **Watson** (2), general manager, London & North Western Railway; Euston Station, London, N. W. 1.;

The Right Hon. Sir E. **Cecil** (already named);

Sir G. **Granet** (2), chairman, Midland Railway; Lombard Street, 80, London, E. C. 3;

G. **Behrens** (already named);

X*** (3) . . . . . . .

### Canada.

H. G. **Kelley** (3), president, Grand Trunk Railway System; Montreal, Que.

### Italy.

R. de **Cornè** (already named);

C. **Crova** (already named);

A. **Alessandri** (3), ingénieur, inspecteur supérieur et conseiller d'administration des chemins de fer de l'Etat (Direction générale); Rome;

E. **Franza** (1), avocat, chef du service du personnel et des affaires générales des chemins de fer de l'Etat (Direction générale); Rome;

G. **Grillo** (1), chef de service principal à la Direction générale des chemins de fer de l'Etat; Rome;

F. **Tajani** (1), ingénieur, président de la Fédération des transports; via Nirone, 21, Milan.

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(1) Retires at the 10th session.

(2) Retires at the 11th session.

(3) Retires at the 12th session.

### Japan.

X*** (2) . . . . . . . .

### Holland.

L. M. **Barnet Lyon** (3), ingénieur civil, membre du conseil de surveillance des chemins de fer; Statenlaan, 14, La Haye.

### Poland.

X*** (1) . . . . . . . .

### Rumania.

C. **Mereutza** (2), directeur spécial du service commercial des chemins de fer roumains; Bucarest.

### Sweden.

A. **Granholm** (2), directeur général des chemins de fer de l'Etat; Stockholm.

### Switzerland.

Le Dr. R. **Herold** (1), directeur au département fédéral des postes et des chemins de fer; Berne;

**Zingg** (2), président de la direction générale des chemins de fer fédéraux; Berne;

G. **Kunz** (1), directeur du chemin de fer Berne-Loetschberg-Simplon; Berne.

### Czecho-Slovakia.

E. **Kejr** (3), ingénieur, conseiller des constructions du département V/1 au Ministère des chemins de fer; Prague.

*Administrative Councillor* : A. **Braem** (already named).

SECRETARY'S OFFICE : rue de Louvain, 17, Brussels.

*General Secretary* : J. **Verdeyen** (already named).

*Secretary-Treasurer* : Ed. **Holemans**, inspecteur de direction honoraire des chemins de fer de l'Etat belge.

*Assistant Secretary-Treasurer* :

J. **Habran**, inspecteur de direction aux chemins de fer de l'Etat belge.

*Assistant Secretaries* :

R. **Desprets**, ingénieur principal aux chemins de fer de l'Etat belge;

E. **Minsart**, ingénieur principal aux chemins de fer de l'Etat belge.

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(1) Retires at the 10th session.
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(3) Retires at the 12th session.